Louis F. Sander On

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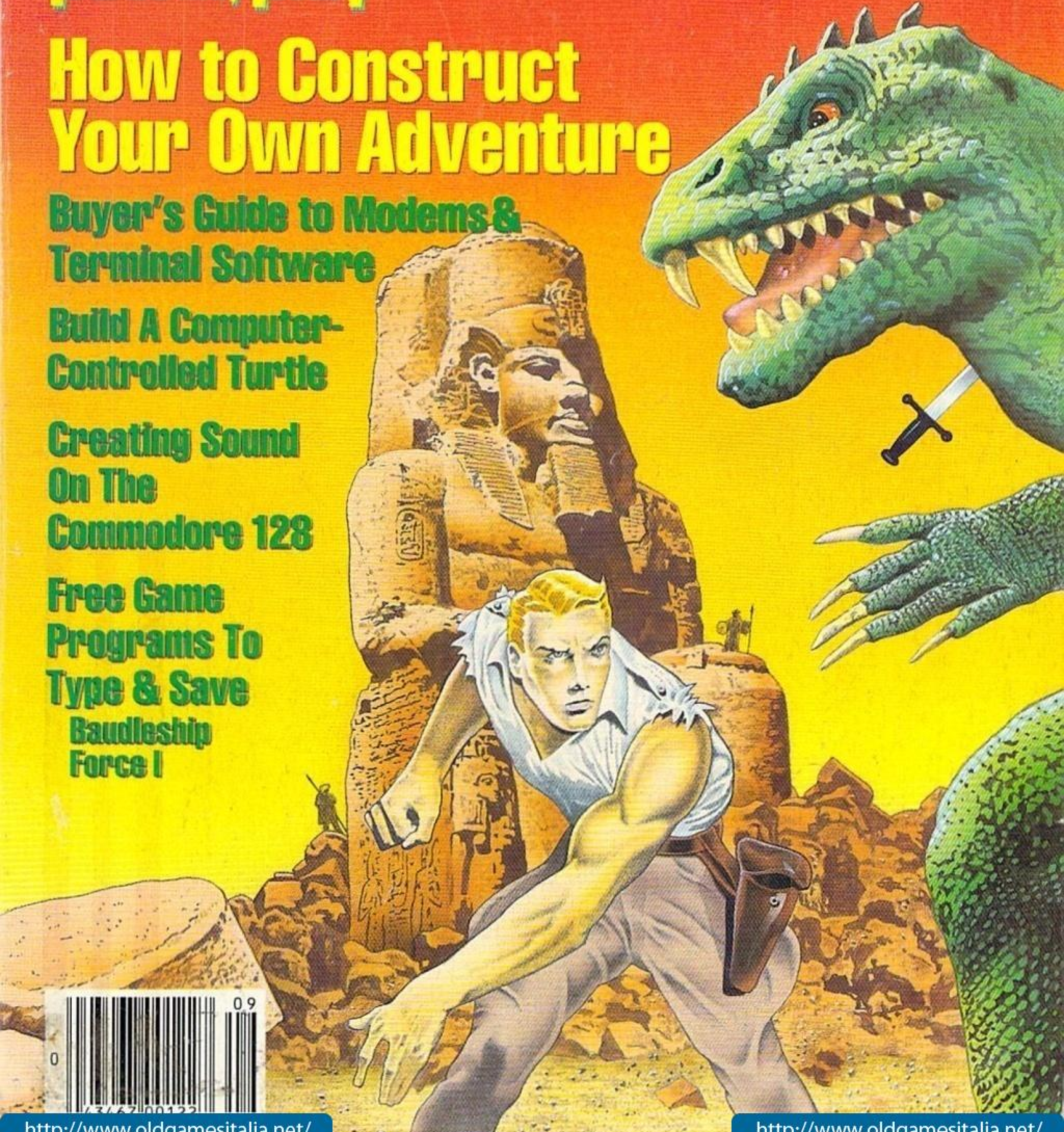

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LETTERS

David Simons Interview

To the Editor:

I would like to supply the missing information for the article "What Next for David Simons" (April/May). CPUCN was the Commodore PET User Club Newsletter. Receipt of this bi-monthly newsletter was almost the only benefit of paying ten pounds to join CPUC, run by Commodore Business Machines Ltd, U.K. IPUG, the Independent PET User Group (now ICPUG, the Independent Commodore Products User Group), provided a better bi-monthly newsletter and other benefits.

In early 1982, CBM (U.K.) disposed of CPUCN to author/publisher Nick Hampshire, and it became the basis of his magazine (now sold to someone else), *Commodore Computing International*.

John Collins
Commodore U.K.

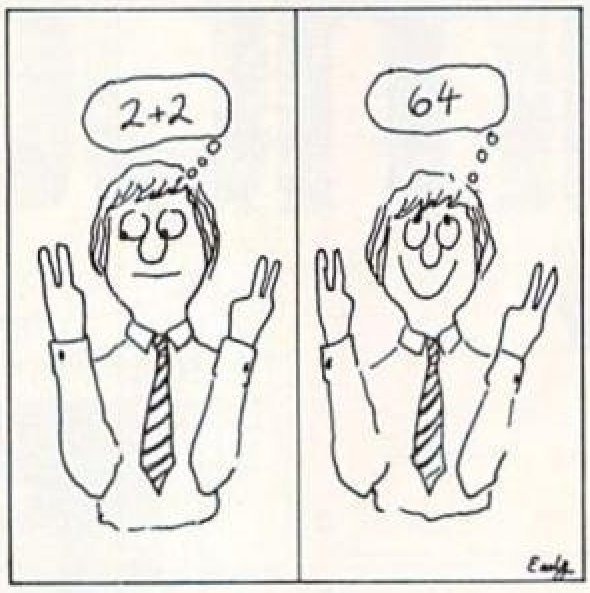
Save-Delete-Rename Procedure

To the Editor:

It's a funny thing when an old head puts 2+2 together and finally gets 4! This happened to me just yesterday as I began to load your magazine entry program.

I have been enjoying the world of the Commodore 64 for almost two years now and had taught myself a simple way to load new segments of a long program. What I did was save and verify the same program name with an additional number or letter. I usually wound up consuming a disk with 15 to 20 partially finished programs, each a bit longer than the last. I never had good luck using the "@," as most operators know.

At the same time, I also read about and used a save-delete-rename procedure in my classroom record keeping (yep, I'm a teacher). From out of the blue, numbed by the length of the magazine entry program, I decided to use such a procedure as a part of any entry program. Well, it works!



All I do now is first type in these three lines and then start entering any new program. When I get itchy and somewhat afraid of losing what I have spent so much time to enter, I merely type RUN 60000, let the drive do its thing, LIST, and then get back to work. This may seem simple, and it may have been said by someone else somewhere, but I am struck by its availability and ease of operation. Perhaps some other plodder of program entry would like to see it.

```
60000 SAVE ''NEW PROGRAM'',
8:VERIFY   ''*'',8
60010 OPEN15,8,15,''S0:OLD PRO-
GRAM''
60020 PRINT#15,''R0:OLD PRO-
GRAM = NEW PROGRAM'':CLOSE15
```

Marvin H. Young
Philadelphia, Pennsylvania

Directory Alphabetizer

To the Editor:

The "1541 Directory Alphabetizer" by Louis Sander (February/March) is a very handy utility, but by adding one line, it can be even better. When the program is run and the "Print to Screen" option is chosen, the only way to get a hard copy is to re-run the entire program. This can mean a considerable wait with a long disk listing, but adding this one line overcomes this.

```
530 OD$ = ''P'':PRINT:PRINT
   ''[RIGHT]OR USE
'OD$ = ''CHR$(34)CHR$(80)CHR$(34)'':
   GO TO 470' FOR A HARDCOPY''
```

With this line in place, you may, if you wish, print the alphabetized listing to the screen and then re-list it to screen or dump it to the printer.

Sy Labar
Bethlehem, Pennsylvania

Notes Toward Creating Better Programs

To the Editor:

After reading Jim Butterfield's article "Notes Toward Creating Better Programs, Part 1" (December/January), I devised a small routine that will allow character string entry using the GET instruction. Before GOSUBing to the accompanying routine, set T% to the tab position where you would like the string to be entered on the screen, and LS% to the desired length of the string. (Note: for easier use, the first column on the screen is column one, not zero.) For example, if you wanted the user to enter his name, but didn't want the name to be longer than ten characters, you could code the following:

```
10PRINT''PLEASE ENTER YOUR
   NAME: '':T% = 25:LS% = 10:
   GOSUB1000
```

Note that T% is equated to the first position after the printed prompt, and that there is no comma or semicolon following the PRINT instruction.

The routine uses Y$ and RETURN's with X$ holding the character string. This particular coding allows only entry of upper-case mode alphabetic characters and spaces, but by chang-

Continued on pg. 6

String Entry

```
10 PRINT"NAME:":T%=6:LS%=11
20 GOSUB 1000:END
1000 GET X$:IF X$=""THEN 1000
1010 IF(ASC(X$)<65 AND X$<>" ")OR
     ASC(X$)>90 THEN 1000
1020 PRINT TAB(T%-1)"[UP]";X$
1030 GET Y$:IF Y$=""THEN 1030
1040 IF Y$=CHR$(13)THEN RETURN
1050 IF ASC(Y$)=20 OR ASC(Y$)=157
     THEN 1090
1060 IF(ASC(Y$)<65 AND Y$<>" ")OR
     ASC(Y$)>90 THEN 1030
1070 IF LEN(X$)=LS%THEN 1030
1080 X$=X$+Y$:PRINT TAB(T%-1)"[UP]";X$
     :GOTO 1030
1090 IF LEN(X$)=0 THEN 1000
1100 PRINT TAB(T%+LEN(X$)-2)"[UP]"
     :X$=LEFT$(X$,LEN(X$)-1):GOTO 1030
```

END

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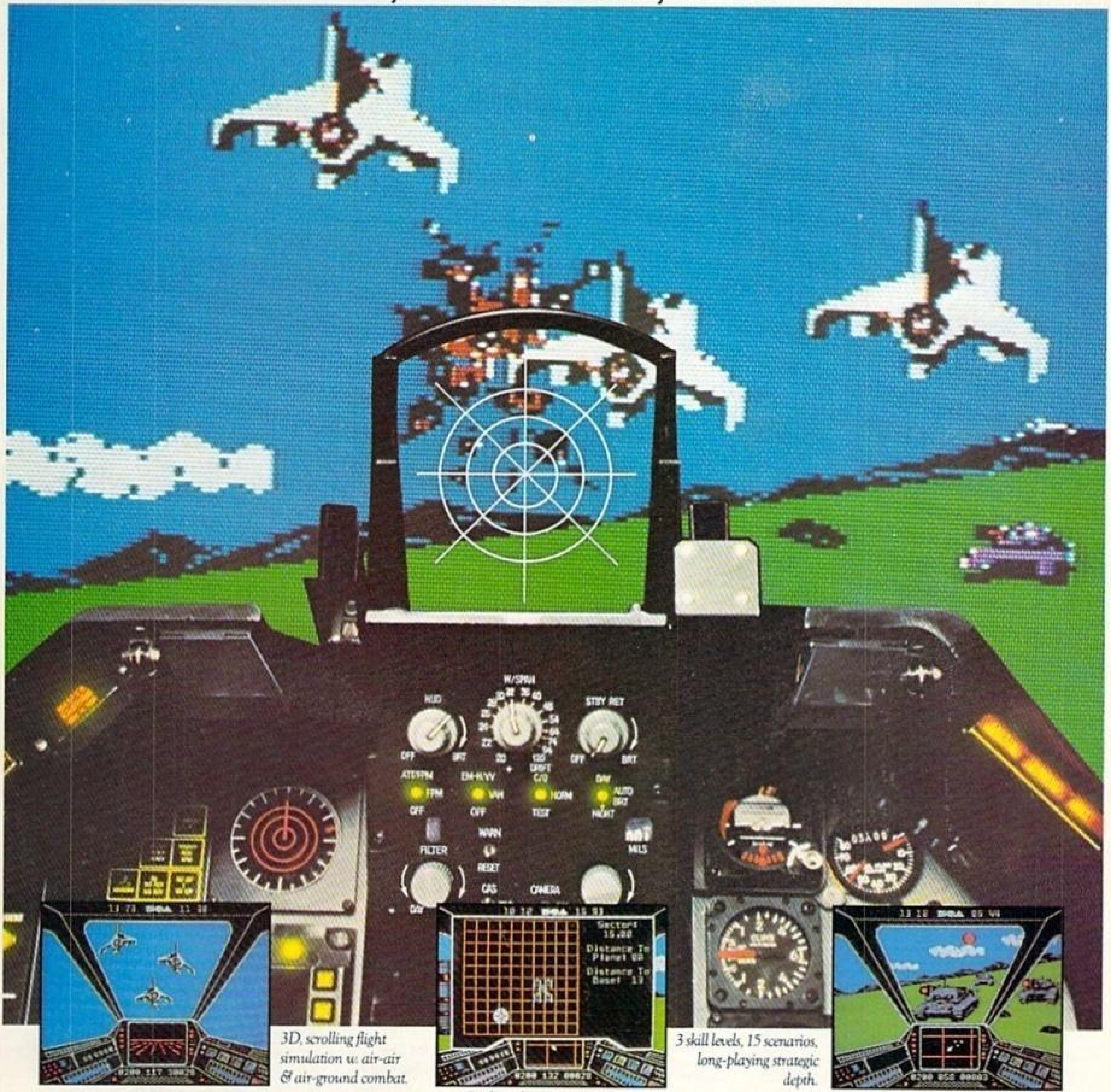

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ing lines 1010 and 1060, you can allow any range of characters to be entered (this can be useful for numeric data entry). By hitting the DELETE key or the cursor-left key, you can delete characters from the screen and the string.

Peter Borsella
Lynbrook, New York

Hail for the PET and 64

To the Editor:

In the February/March issue, you published a jiffy called "Hail for PET and Commodore 64," by Jerry A. Sturdivant. He stated that the idea behind the program was to write a game on as few lines as possible. Here is a jiffy with the same idea in mind that I wish to share with my fellow readers.

You are walking home and decide to take the short cut through the alley. Here you stumble upon the newest gambling craze. It's a spider race, and you just happen to have $100 in your pocket. You pick a spider and throw down an amount you wish to bet. They're off. At the finish, winner takes all.

Line by line explanation of the program:

Line 1: Set M (how much money you have) equal to 100 if you have lost it all. Print the amount of money you have. W = input the spider you believe will win (1-4). B = input the amount of the bet you will make. If the bet is for more money than you have, set bet equal to zero. Clear the screen.

Line 2: Poke spiders, spider numbers, and the finish line onto the screen.

Line 3: Generate random numbers one through four and move appropriate spider. If the spider has not reached the finish line, generate a new random number.

Line 4: Calculate money lost or won. You lose the amount of your bet or win three times your bet. Print new amount of money (included so player will see first that he has lost all of his money before he gets another 100 to squander). GOTO line 1 for another spider race.

To type the program in on four lines requires elimination of all spaces and the abbreviation of keywords.

Don White
Utica, New York

Disk Enlarger

To the Editor:

Something terrible just happened. My husband, a subscriber to *Power/Play*, received the April/May 1985 edition and decided to use the program on page 92, "Disk Enlarger." He likes to save space on disks and he was looking for such a program.

I was in another room when I heard a large "boom!" I ran into the computer room and saw smoke coming out of the TV monitor. My husband was shaking and looked pale. I called an ambulance and he's now in the emergency room.

You can tell Mr. Ferdinand Maximillian III, that his program was so powerful that the TV exploded as he predicted. You will be hearing from our attorney.

Roselyn Rosenblatt
Bronx, New York

P.S. April Fools!

Commodore Power/Play welcomes letters from readers. Do you have an unusual application for your Commodore computer? Do you wish to comment on an article? Would you like to make a suggestion on how we can better serve our readers? Please send them to:

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ATTN: Letters

C

Spider Race

```
1 M=((M<>0)+1)*100+M:PRINT"[CLEAR]HAVE$"M:INPUT"
  SPIDER";W:INPUT"BET";B:B=((B>M)+1)*B:PRINT"[CLEAR]"
2 FOR X=1 TO 4:S(X)=985+X*160:POKE S(X)-1,X+48:POKE
  S(X),42:NEXT:FOR X=1 TO 15:POKE 1102+X*40,66:NEXT
3 X=1+INT(4*RND(1)):S(X)=S(X)+1:POKE S(X)-1,32
  :POKE S(X),42:IF PEEK(S(X)-40)<>66 GOTO 3
4 M=M+((X=W)*2+1)*(((X=W)*2-1)*B):FOR X=1 TO 200
  :PRINT"[HOME]HAVE$"M:NEXT:GOTO 1
```

END

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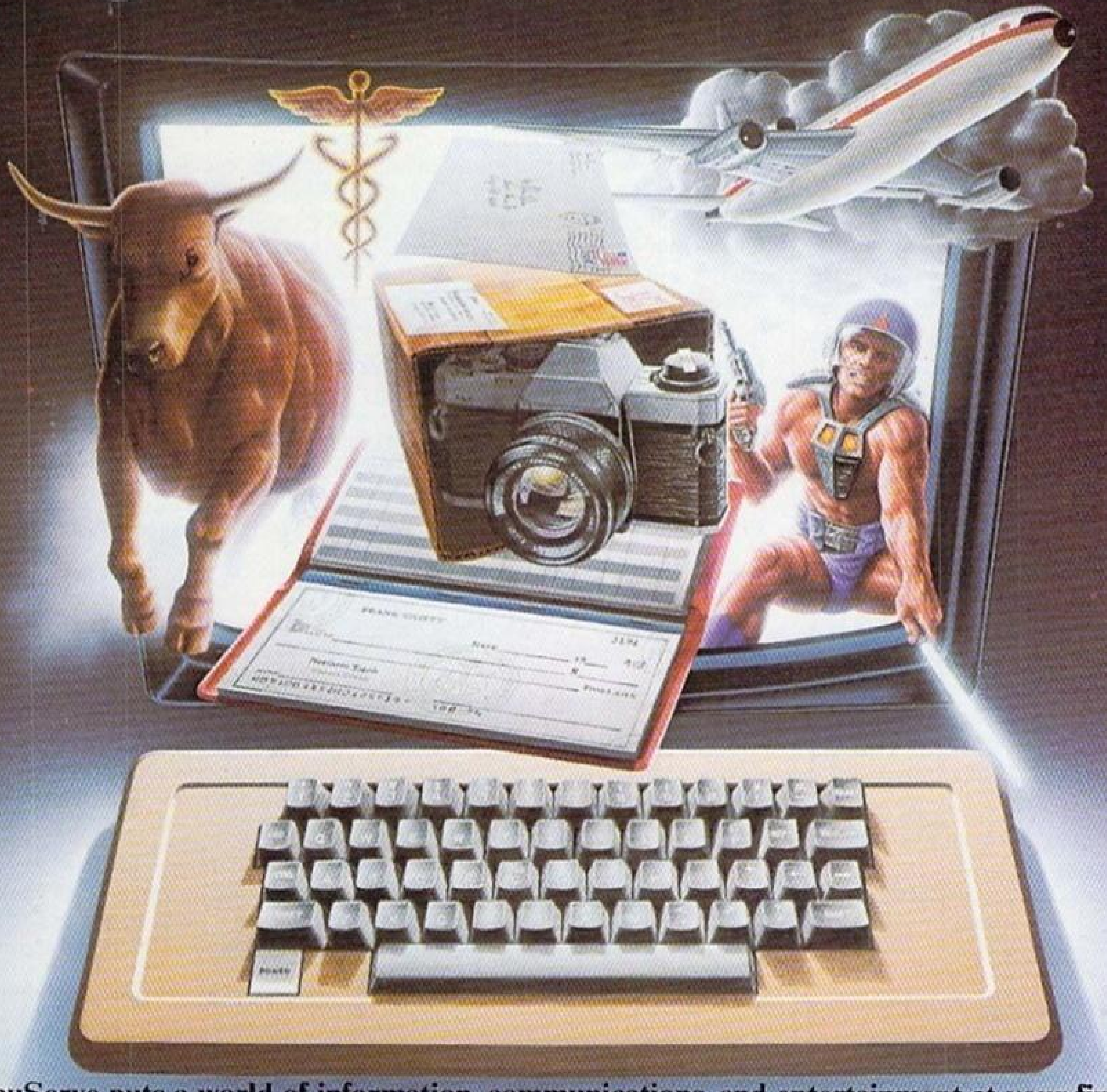

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JOYSTICK LUNATIC

BY STEVE FINKEL

To Err is Human

Over the years, terms have developed to describe errors. Descriptive phrases have evolved for all types: the comical "flub," the elegant "faux pas," the brash "blunder," the earthy "screw-up," the mechanistic "malfunction," and the simplistic "boo-boo." Our examination of errors focuses on programming mistakes—in particular, those that haunt the waking hours of all computer users: error messages.

How does your computer feel, knowing that it is a competent machine, processing a mistake and delivering that information to a fallible, all-too-human counterpart who insists on mis-typing on its keyboard? After closely observing many computers, and even more mistakes, I have come to realize that a computer's error messages are really only a cover-up for how the computer *really* feels about your mistakes.

The following list of error messages reveals the true nature of your computer. On the left is the familiar (if detested) message that appears on your screen. On the right is the explanation of what your computer is *really* telling you. The tone of the error message depends on your relationship with your computer, although most computers seem to have a real antagonistic streak. And more often than not, when delivering an error message, the computer really does have a chip on its shoulder.

ERROR MESSAGE	WHAT YOUR COMPUTER IS REALLY TELLING YOU
TOO MANY FILES	Files...piles of files...aisles of piles of files...miles of aisles of piles of files...Oh, the trials of miles of aisles of piles of files.
FILE OPEN	Hey! Your file's open. Ha, ha, you looked, you turkey.
FILE NOT OPEN	What do you think I am, anyway? A computer or a master safecracker? If you do expect me to be breaking into files, at least provide me with the proper tools—like a crowbar and a stocking to disguise myself.
FILE NOT FOUND	You just had me rummaging through all these files looking for one that doesn't even exist. Do you know how frustrating that is for me?
DEVICE NOT PRESENT	I've decided that the only peripheral devices you can use are ones that were given to you as gifts. The device you are now using will work fine only after you give it away to somebody else as a present. Remember, it's better to give than receive.
NOT INPUT FILE	Well, it's *not*.
NOT OUTPUT FILE	Make up your mind, will you?
MISSING FILE NAME	What am I supposed to be, a mind reader?
ILLEGAL DEVICE NUMBER	Exactly how did you happen to come by this device number, anyway? I hope you're not thinking of leaving the country. I imagine the FBI wouldn't mind hearing about this...
NEXT WITHOUT FOR	That's like Laurel without Hardy, Abbott without Costello, peanut butter without jelly, Minneapolis without St. Paul, death without taxes, a programmer without any common sense.

Continued on pg. 10

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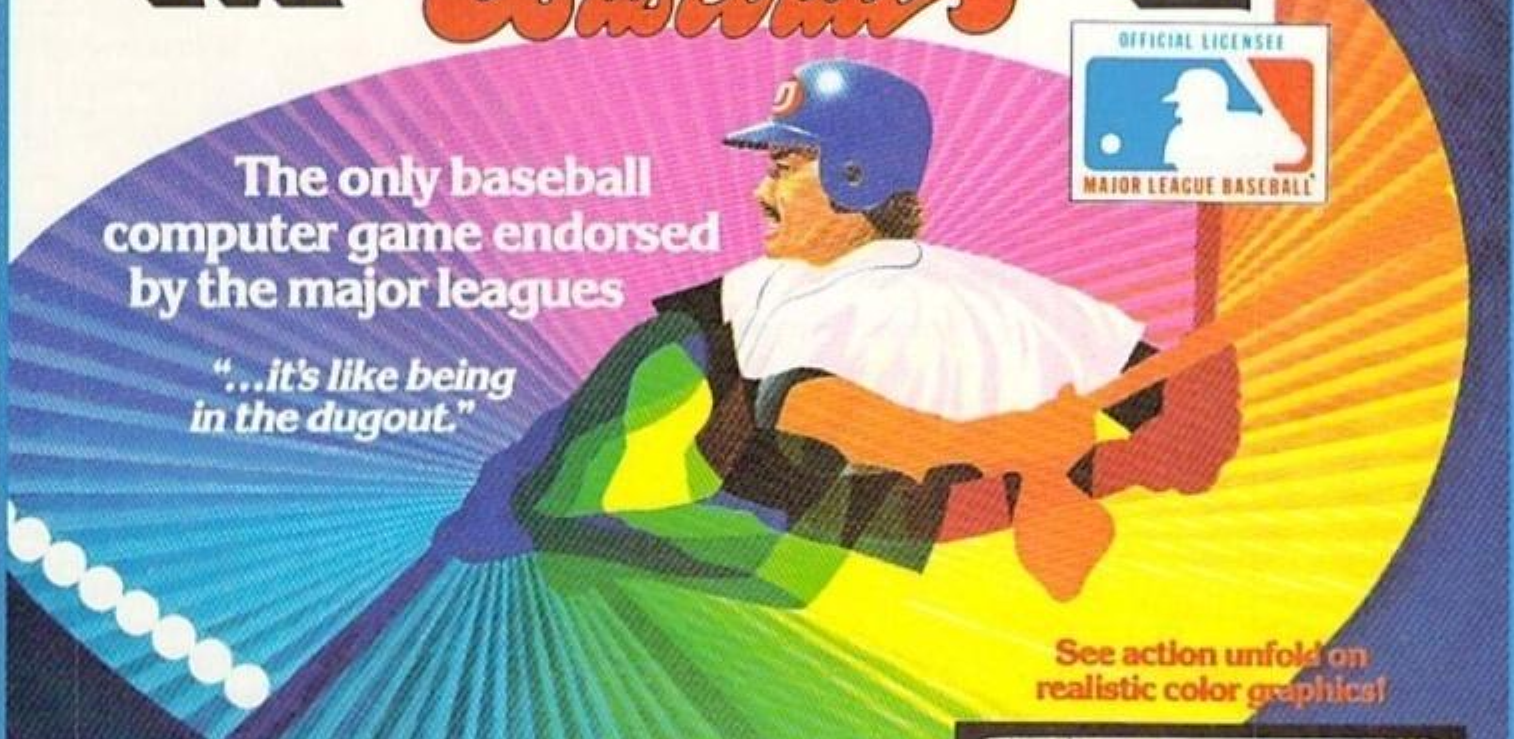

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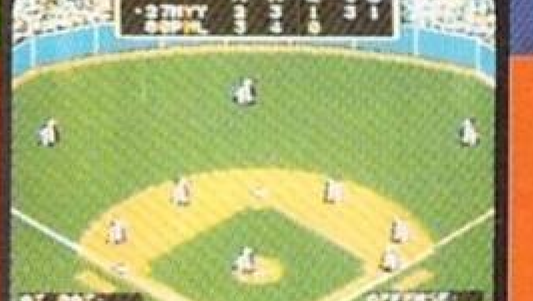

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Circle Reader Service No. 9

JOYSTICK LUNATIC

ERROR MESSAGE	WHAT YOUR COMPUTER IS REALLY TELLING YOU
SYNTAX	I can't understand a single word you're typing. You wanna try typing with your hands this time?
RETURN WITHOUT GOSUB	I don't care if it DID follow you home! Go back into the woods and don't come back until you get rid of that GOSUB.
OUT OF DATA	Out of data? Out of luck.
ILLEGAL QUANTITY	Whoa, fella. That quantity doesn't look too kosher to me.
OVERFLOW	This is just too much. I've had enough of you for now. I wish I were in the Bahamas.
OUT OF MEMORY	I've been so forgetful lately...What did you say your name was again?
UNDEFINED STATEMENT	What do I look like, Webster's Dictionary?
BAD SUBSCRIPT	Not only is the subscript bad, when's the last time you took a shower?
REDIMENSIONED ARRAY	I'm obviously tired, and you can't even stick to one set of array dimensions. How about a little consideration, huh, fella?
DIVISION BY ZERO	Nope, I'm not going to allow you to do any division, you zero.
ILLEGAL DIRECT	Not only can't you stay on the right side of the law, you don't even try to hide it.
TYPE MISMATCH	Sorry, it won't work out between us—you're not my type.
STRING TOO LONG	Or was that movie called "A Bridge Too Far?" Well, whatever, it was entertaining, don't you think?
FILE DATA	What do I look like, a secretary? Next thing I know, you'll be trying to get me to answer the phones and get coffee.
FORMULA TOO COMPLEX	I can't be bothered right now with your little equations. Why don't you go get Einstein to solve it for you?
CAN'T CONTINUE	I think I'm going to end it all...
UNDEFINED FUNCTION	Would you kindly keep your disgusting obscure functions to yourself?
VERIFY	Basically, I trust you about as far as I could throw you.
LOAD	I think that's a load of...
BREAK	Quit bothering me, I'm on my break. Computer Local #64 says I get a six-hour break twice a day.
CAN'T RESUME	I'm just not up to it. My horoscope advises against it.

Continued on pg. 12

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JOYSTICK LUNATIC

ERROR MESSAGE	WHAT YOUR COMPUTER IS REALLY TELLING YOU
LOOP NOT FOUND	I'm on strike until you take me on a vacation to Chicago.
LOOP WITHOUT DO	All right, so you broke down and took me to Chicago. But you made me stay in the hotel room the whole time. I didn't get to do anything.
DIRECT MODE ONLY	Wait, I've changed my mind. You could also direct traffic.
NO GRAPHICS AREA	But there are other areas you might want to consider...Burma or Sudan for instance.
BAD DISK	Bad disk? Bad luck.

So now you know what your computer is really telling you when it gives you an error message. What can you do to improve your strained relations? Try re-reading the "Making Friends With [the] SID [Chip]" articles in old issues of *Power/Play*. However, that probably won't win over the whole machine.

I've found that I can keep my computer reasonably happy by entertaining it: When I go to the movies or to parties, I take it along. It doesn't cost any extra, and the only drawback is that people think you have serious emotional problems. Once you have established a comfortable rapport with your computer, your error messages will decrease radically. Then you can start worrying about disk errors. Disk drives can be downright nasty! C

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Database: A complete multi-keyed fixed-record-length data base manager. Sort or select [using all relational operators:, =, >, <, AND, OR, NOT, wild card] on any field, perform computations on numeric fields. Any operation can be performed on all, or only selected records. All fields completely user-definable. Can be used for any number of tasks, including accounting, mailing lists, inventory control, record, tape, or book cataloging, expense account maintenance, or as an electronic rolodex. Even if you use your Commodore for nothing else, this program alone might justify its expense.

Word Processor: A full-featured menu-driven word processor including: very fast file commands, screen editing, text locating and full control over margins, spacing, paging, indentation, and justification. "... *well done and highly functional ... Provides an excellent alternative to the high priced word processors ... this is an excellent buy. Highly recommended.*" — Midnite Software Gazette. "*Provides good basic features.*" — Compute's Gazette.

Copycalc: An electronic spreadsheet. Turns your Commodore into a visible balance sheet; includes screen editor. "*Excellent program for budgeting, estimating, or any math-oriented use ... well worth the money. Highly recommended.*" — Midnite Software Gazette.

Also included: **ReportGen, ReportMerge** [interface W/P with Database to create form letters, statements, invoices, mailing labels, other reports.]; **Baseball Statistician** [compiles batting statistics for a baseball league]; several W/P utilities, including **Index** [indexes W/P's text files]; several Database utilities, including **DBmerge** [facilitates multi-file database applications.], and **DBStat** [analyzes D/B files]; a programming utility, **ASCII,** which converts text files [program listings] into program files; also **Checkbook**; **Inventory**; **Paper Route**; **Loan Analysis**; **Breakeven Analysis**; **Depreciation**; **Labeler**; **File Copier**; more.

Versions of the package are available for every Commodore computer having a minimum of 10k RAM. All programs will support tape, disk, and printer. Price includes documentation and shipping; Calif. residents add 6%. Add $3 for credit card, COD, 8050 disk, or tape orders [disk only for Plus4™ and 16™.] No personal checks from outside USA. This ad is the catalog; a sampling of program output is available for $2.

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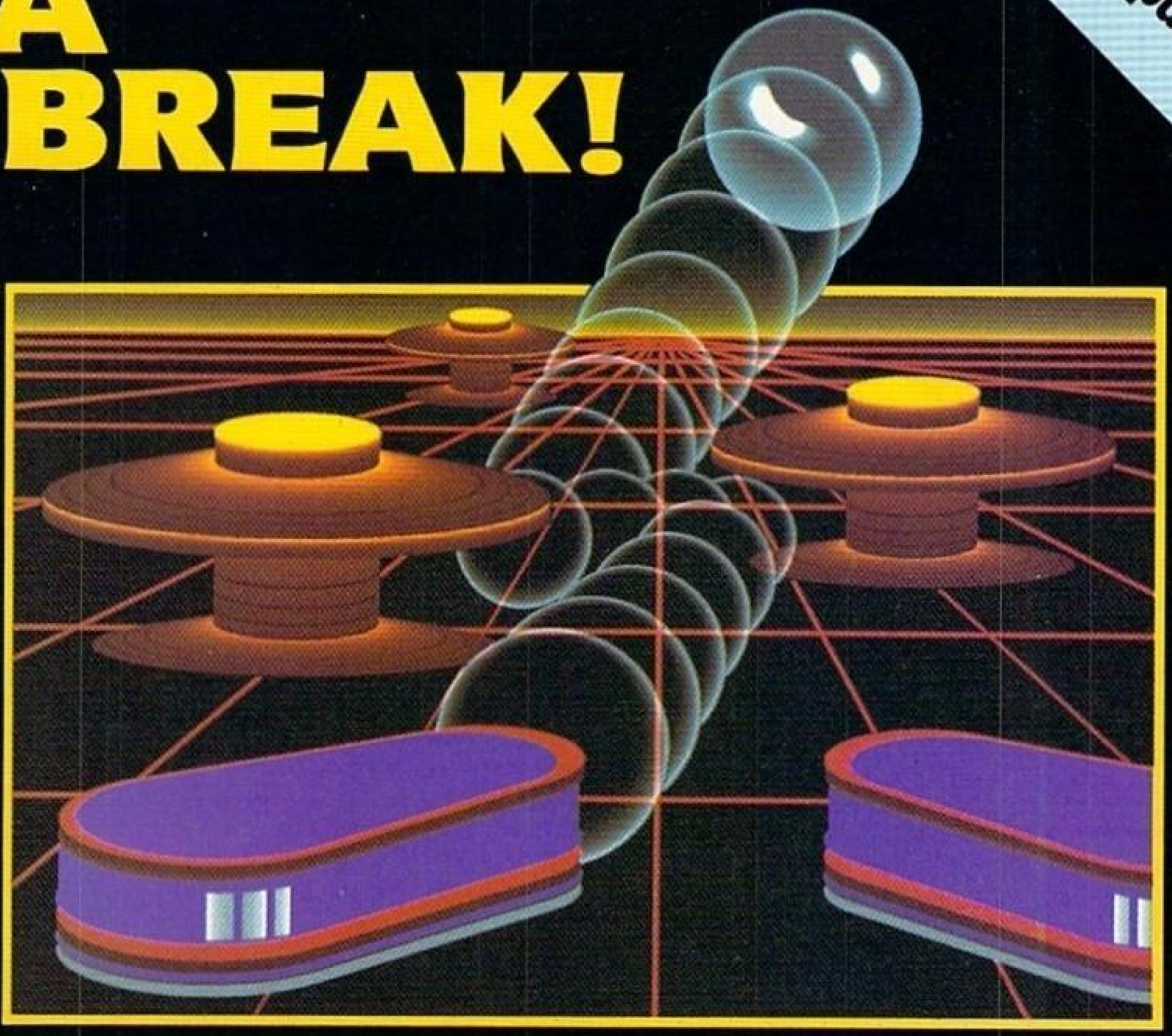

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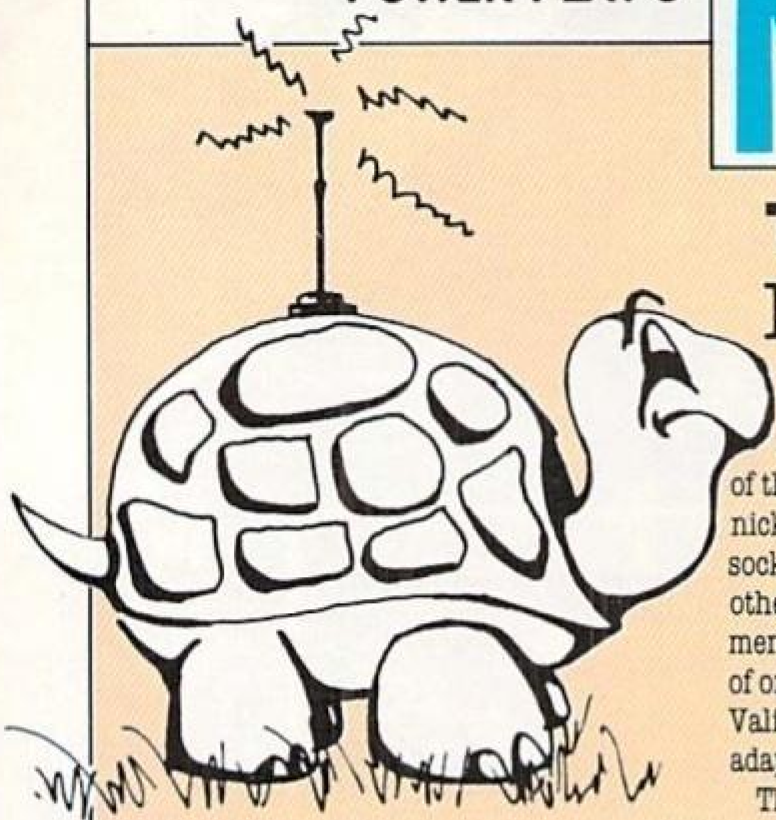
POWER PLAY'S NEWS FROM THE FRONT



Turtle Robot

Kobetek (113 Commercial Street, New Minas, Nova Scotia, Canada B4N 3E6) has announced the availability of the Valiant Turtle. Unlike earlier turtles, this versatile robot is remote controlled by an infra-red transmitter and the software allows it to execute all LOGO commands. The turtle's two independent stepper motors make it one of the most accurate on the market, according to the manufacturer. It is powered by ten nickel cadmium rechargeable batteries—simply plug the power adapter (included) into a socket on the turtle. Two illuminated eyes serve as power indicators—they go out before any other functions fail—and it carries a pen which can be raised or lowered to trace its movements. The turtle moves in units of one centimeter but can be programmed to move in units of one millimeter, one inch or one meter. It can also draw smooth circles and arcs. The Valiant Turtle comes as a complete package: turtle, batteries, infra-red transmitter, power adapter, pen, manuals and software.

The Valiant Turtle interfaces with the Commodore 64.

Expansion Guide for the Commodore 64

Commodore 64 Expansion Guide, written by Gary Phillips and published by Tab Books (Blue Ridge Summit, PA 17214), is a guide to hardware accessories and add-ons for the 64. The book offers opinions on which ones are the best buys for the money and applications the user has in mind, and explains how products from other manufacturers can be interfaced with the 64.

Each accessory is chosen for value and performance, based on the author's testing and examination. The book provides background on each type of device—printers, disk drives, modems, monitors, and specialized accessories from light pens, graphics tablets, and security units, to music keyboards, voice synthesizers, and photographic units. Reviews of each product include comparative tables of vital features as well as realistic assessments of flaws and disadvantages, unique features and strong points.

There is information on how each device can be interfaced or connected to the 64 and a full glossary of computer terms. The book retails for $22.95 (hardbound) and $16.45 (paperback).

Markers for Computer Disks

Sanford Corporation (2740 Washington Blvd., Bellwood, Illinois 60104) has released two new types of markers designed specifically for use on computer disks. One of the new markers called Diskribe can be used directly on computer software disk sleeves for safe identification and reference. The ink is quick-drying and permanent. Tests verify that the markings do not affect information on the disk itself. Availability of two distinct Diskribe colors—silver and gold—enables users to color code disk markings to identify different kinds of data.

The other marker, called the Label Pen, meets the need for a writing instrument that really "takes" on slick-finish and other hard-to-mark labels currently being used on diskettes and VCR cassettes. The extra-fine point and high-intensity permanent ink makes writing easier to read on small labels. The ink dries quickly and resists smearing. The Label Pen is available in three colors—black, red and blue.

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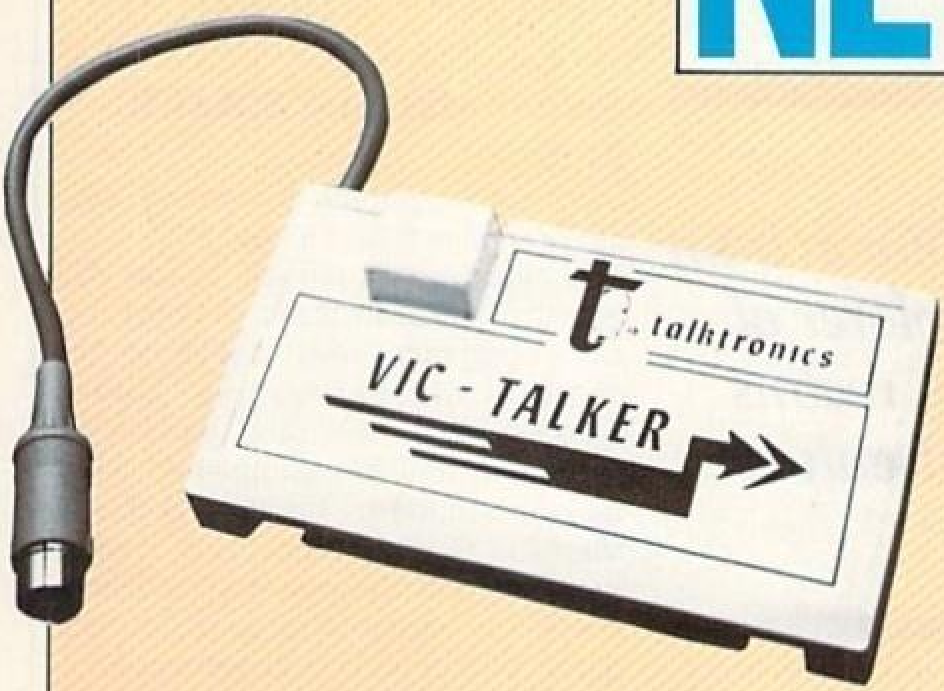
Markers for use on computer software aid in organization.

Music for the Commodore 64

QRS Music Rolls (1026 Niagara Street, Buffalo, Ny 14213), an 85 year-old manufacturer of piano rolls, has announced a new line of hardware and software products. Designed to join computers to musical instruments that use a standard Musical Instrument Digital Interface (MIDI), the company's hardware products include a MIDI interface ($49.95) and general purpose MIDI connecting cable ($19.95). The software products, on disk, enable a Commodore 64 to "play" music through one or more instruments using the MIDI interface. QRS also has a library of over 10,000 piano rolls, digitally encoded to run on the 64. Each six-song "album" has a suggested retail price of $19.95.

POWER PLAY'S NEWS FROM THE FRONT



Speech Synthesizer for the VIC 20

Talktronics (27341 Eastridge Drive, El Toro, CA 92630) has released the **VIC-Talker** speech synthesis cartridge for the VIC 20. VIC-Talker provides unlimited vocabulary translation of text to synthesized speech using advanced English language pronunciation rules and a user-expandable exception memory. The product is self-contained and is used with an unexpanded VIC. The cartridge incorporates an internal audio mixer to blend the synthesized voice output with sounds generated by the VIC-Talker sound chip for simultaneous sound effects with voice. VIC-Talker retails for $89.00.

Fast-Loader Cartridge

Access Software (925 East 900 South, Salt Lake City, UT 84105) has released **Mach 5**, a fast-loader enhancement package for the Commodore 64 and 1541 disk drive. The **Mach 5** is completely transparent, does not disturb RAM, works with all popular printers, and loads disk-based programs up to 500% faster.

In addition to the fast-load cartridge, Access includes two enhancement programs. **Disk Organizer** automatically extracts directory information from the user's disk library and catalogs it for future reference. Dumps to either the screen or a line printer are also supported. **BASIC Plus 4K** provides an extra 4K bytes to the BASIC workspace. Compatibility with CBM BASIC version 2 is maintained.

Danger and Mystery

Microcomputer Games (4517 Harford Road, Baltimore, MD 21214) has released **Maxwell Manor**, a game for the Commodore 64 with more than 50 screens, 100 variations, and ten skill levels. You are Professor Arabesque and your mission is to find the Skull of Doom that controls Maxwell Manor and destroy it. But beware of the man-eating bugs in the garden, poisonous blood spots in the front hall, and huge spiders downstairs. The program retails for $25.00.

Electronic Retail Store

Comp-U-Card International (777 Summer Street, Stamford, CT 06901) has announced the opening of the **Shopping Machine Store**, one of the first completely electronic retail stores.

Located in the Park City Center of Lancaster, Pennsylvania, the Shopping Machine Store contains four laser video disk kiosks and three on-line computers. The kiosks, activated by touching a sensor screen, demonstrate and display merchandise ranging from lobsters to VCR's, and automobiles to trips to Paris. By combining the kiosks with the personal computers, customers can purchase more than 100,000 products at savings up to 50%.

Both systems are easy to use, requiring no computer knowledge. Customers simply respond to product feature questions such as "What size TV are you interested in?" 'Do you want remote control?" and "What's the most you want to spend?" The computer then selects the televisions that meet the consumer's criteria and displays them.

Merchandise is paid for by running a credit card through the credit card reader, or by check. Items are delivered to the home, office, or specified location by a member of a Comp-U-Card's nationwide vendor network. All merchandise comes with full U.S. manufacturers' warranties.

Wizard Expansion Set

Progressive Peripherals & Software's (2186 South Holly, Suite 2, Denver, Colorado 80222) contest for **Wizard** players has resulted in the **Wizard Expansion Set**, an even more demanding game than its predecessor. The contest, which ran from July to October of 1984, asked **Wizard** players to build additional levels for the game. A player must have the original **Wizard** game disk to play the expansion set. (See the review of **Wizard** in the December/January **Commodore Power/Play**.)

More News on page 127

ADVENTURE ROAD

BY SHAY ADDAMS

Mindwheel Sparks Parser War

The *de facto* industry standard for years, Infocom's parser (an adventure game's vocabulary) was recently knocked out of the saddle when Synapse Software's *Mindwheel* for the 64 rolled into sight and triggered what's shaping up as a full-scale Parser War. Synapse's parser outguns the competition by increasing the kinds of things you can say to the other characters in the game, which enhances the feeling that you're involved in a real story. Beaten at their own game for the first time, the wizards at Infocom have geared up to develop an improved parser in hopes of regaining their longstanding reign over the kingdom of adventure games.

With the Synapse parser, you can say things such as, "Irv, what is east of here?" and even ask other characters about their inventory. Multiple commands are permitted, even in conversation, so you can say, "Mona, get the brooch and give it to the thug and follow me." With a parser capable of understanding such complex commands, game designers can dream up more subtle problems and intricate situations—so you can expect to see some unusual adventures from Synapse. (Though fast, efficient, and easily state-of-the-art, the parser did occasionally deliver a bizarre response. When I said, "Feed the horse," the program asked, "Who do you want to feed the horse to?")

An all-text tale, *Mindwheel* begins in the not-so-distant future and sends you on a telepathic trip back through time to find the Wheel of Wisdom, the only thing that can save civilization from self-destruction. Your journey progresses through the minds of four dead people—a rock star, a dictator, a poet, and a "female Einstein." Each of their minds is like another world: In the rock star's mind, you find yourself on stage at a huge concert, while the dictator's mind contains a sinister castle. Numerous characters inhabit these minds, and your interactions with the demons, thugs and spider ladies, not to mention Irv the Frog, are vital to the mission's success.

> *News and opinion from a leading explorer of those fantasy realms known as adventure games.*

Mindwheel introduces a new technique to the adventure genre, with what could be called "real-time" background. A common characteristic of true interactive fiction, "background" is composed of things that keep happening around you even if you don't do anything (except type "wait"). In *Mindwheel*, this usually consists of a character doing something insignificant or talking—but this can happen at any time. And once, while I was trying to figure out how to deal with a robot in the bank, a grinning demon jumped out and captured me. This feature contributes unexpected suspense to the adventure experience as well as a "be here now" quality that makes it more intense than many adventures.

With lots of riddles and people-oriented problems in addition to the typical object-based situations, *Mindwheel* is an intermediate-level game. You often have to think poetically as well as logically, for it was written by Robert Pinsky, an award-winning poet with an evocative style and a truly offbeat sense of humor. *Mindwheel* enables you to obtain a hard copy of the game in progress and is packaged on both sides of a pair of disks that come with a hard-bound book containing the first few chapters of the story.

A science fiction saga about a space ship called Essex is the next title in the Synapse line of "electronic novels" and should be off the pad by the time you read this.

Spider Man and S.A.G.A.-Plus

If you prefer graphic adventures, *Spider Man* also sports a new parser, the first significant upgrade in the Adventure International adventures since graphics were added to the original all-text games. Called S.A.G.A.-Plus, the new parser lets you issue multiple commands when moving around by typing, "N then S then E." *Spider Man*'s crisp, colorful graphics and the new parser almost made me forget it was an Adams game, which previously were not noted for the sophistication of their parsers. The program loads new pictures in five seconds, some of the fastest disk access I've seen from a Commodore 64 graphic adventure.

Spider Man's plot resembles that of *The Hulk*, the initial game in the QuestProbe series, for your goal is to round up gems and store them on the first floor of an abandoned building to score points. Other characters from the Marvel Comic books appear intermittently, clutching the gems and daring you to take them. You can't converse as articulately with Lizard Man, Sand Man and the other comic book characters as you can with people in the Infocom and Synapse games, but there's more emphasis on characters here than in previous Scott Adams adventures. The spot animation, in which *Spider Man* appears to move, is faster and more effectively executed than similar scenes in *Hulk*. It's an intermediate-level challenge.

Other New Graphic Adventures for the 64

Another new adventure—with graphics that could pass for computer art—Activision's *Mindshadow* has a more sophisticated parser than *Spider Man*'s, but the problems are so easy that I can recommend it only for novice adventurers. Though aimed at teenagers, *Swiss Family Robinson* (a graphic game in Spinnaker's Windham Classics series) is tricky and clever enough to satisfy older players, and a good game for the family to collaborate on. *Cave Girl Claire*, one of

Continued on pg. 126

"KENNEDY APPROACH..."

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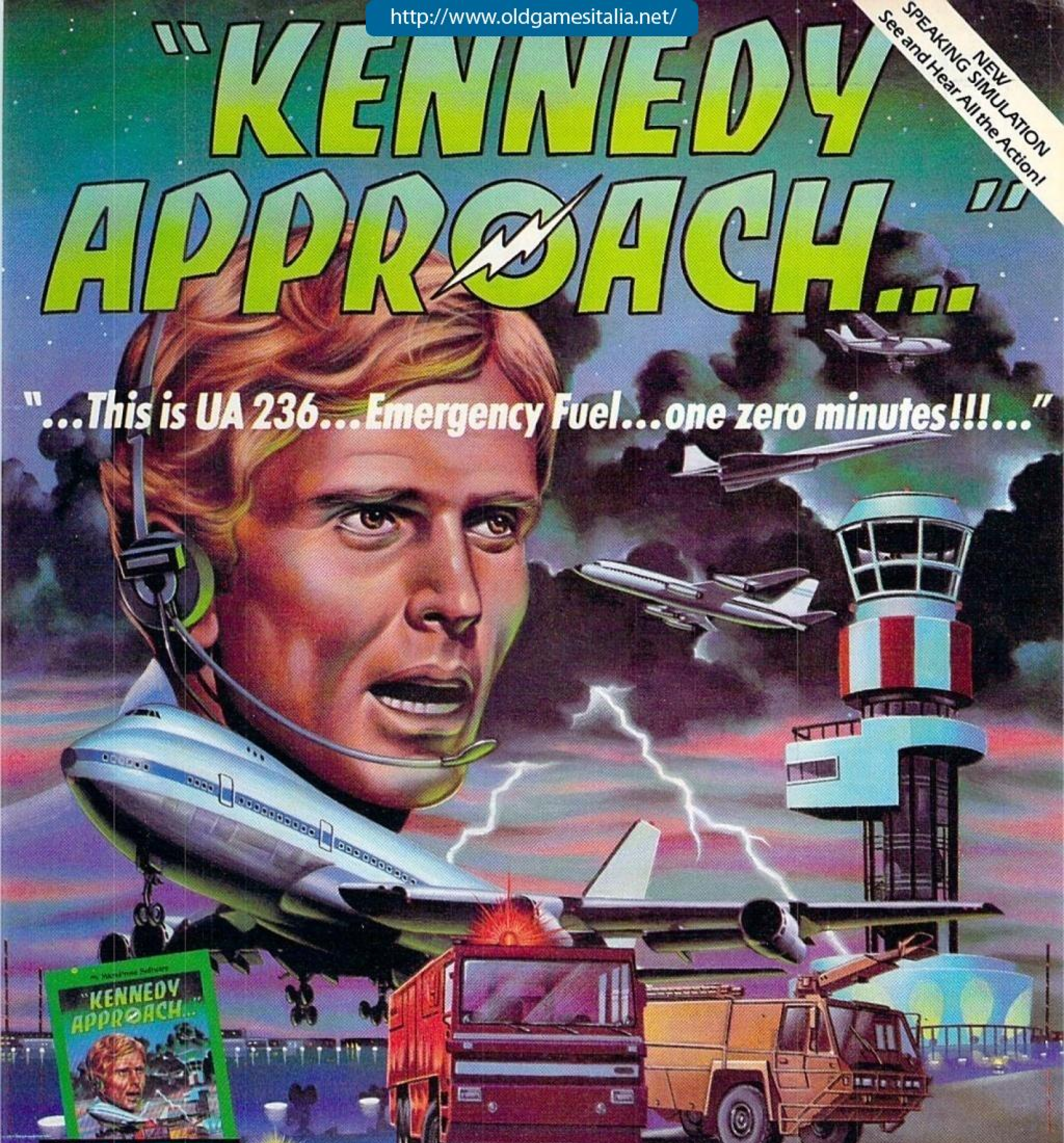
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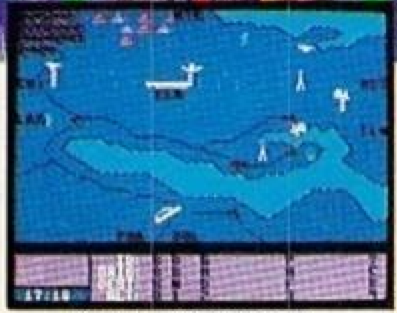

Commodore-64 Screen Picture

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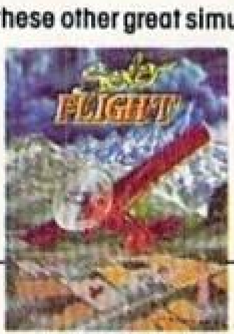

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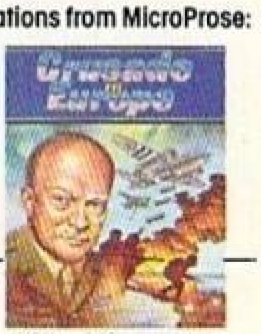

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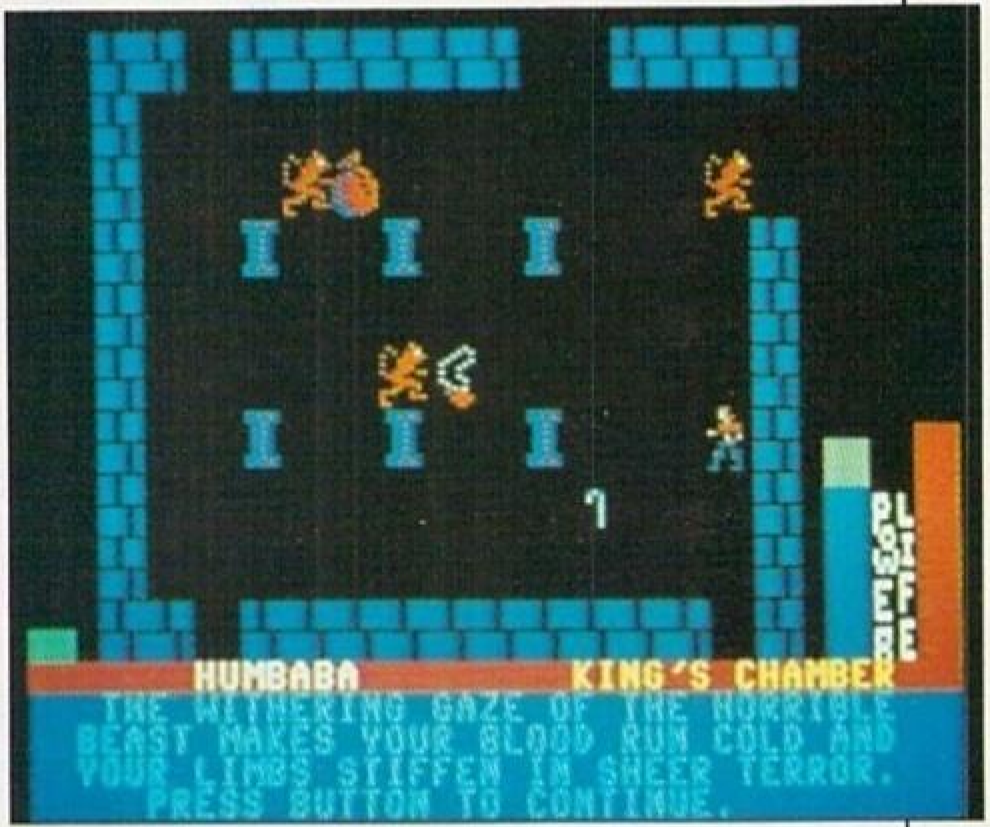
REVIEWED BY MARK COTONE

Adventure Construction Set

Computer: Commodore 64
Publisher: Electronic Arts
2755 Campus Drive
San Mateo, CA 94403
Medium: Disk
Retail Price: $34.99

The program is menu-driven making for uncomplicated use, whether you are modifying one of eight adventures included, or building a masterpiece from scratch.



THE WITHERING GAZE OF THE HORRIBLE BEAST MAKES YOUR BLOOD RUN COLD AND YOUR LIMBS STIFFEN IN SHEER TERROR. PRESS BUTTON TO CONTINUE.

All adventurers take note: You may not, under any circumstances, pass over this page. This review is required reading. Mandatory. No exceptions.

Don't be taken back by this adamant stance. It's for your own good. I have a product that you will find both alluring and satisfying. It's Stuart Smith's *Adventure Construction Set* by Electronic Arts, and it is a must for all microvoyagers, from the sorcerer to the apprentice, to everyone in between.

This project is an unprecedented disk-driven triple play; a sweeping package containing three complete programs designed to enlighten you about every aspect of computer fantasy lands. There's an orientation section called the Land of Aventuria, a new major league challenge entitled Rivers of Light, and the construction set itself.

Aventuria is a tutorial program aimed at introducing prospective players to Smith's fictive worlds. By following a simple map provided in an accompanying manual, you move through seven "mini-adventures." These mini-adventures are a group of quick quizzes structured to guide you, slowly but surely, through an instructional tour of game play. Each stop increases in complexity, confronting the player with a series of complications whose solutions will draw upon your ability to combine previously obtained Aventuria skills with newly acquired dexterities.

You begin with Secret Agent 00111, a straightforward "how-to-play" lesson that nails down the basics. After you familiarize yourself with these ground rules, your tutelage moves you to a variety of locations: from the Rabbit Hole in Alice's Wonderland, to a stone labyrinth in a Nazi castle; across the tumultous Delaware with Washington and his troops, and onward into the vastness of our galaxy aboard an Enterprise-style starship.

The learning process is brilliantly subtle. Any beginner's feelings of intimidation will quickly melt beneath the thrill of exploring the diverse assortment of didactic tests. Educated guesses are encouraged and mistakes can be made, for an automatic save function has been incorporated. If your character should inadvertently step into a life-sapping trap, his end can be viewed as a means for enlightenment. You can resurrect him with the knowledge of events which brought about his demise, and, hopefully, the presence of mind to tread a new path toward your goal.

An experienced campaigner might find this all a bit childish. But fear not, your time is near. Simply arrange for a short stay at Aventuria, only until you're comfortable with the playing principles, and then go on to the River of Light.

Stuart Smith is a designer with impressive credentials. Noting his past hits, *Ali Baba and the Forty Thieves* and *Return of Heracules*, one can't help but approach his new adventure with trepidation, bracing for the inevitable shot of witty, mind-boggling puzzlement. And true to form, Smith delivers.

Rivers of Light is set at the dawn of civilization in the Near East. Your mission is to search along the Tigris and Euphrates Rivers, and on to ancient Egypt, all in an attempt to acquire the essence of Osiris, god of the dead and giver of eternal life.

The manual suggests that you refer to an atlas or world map to research the important locations and historial facts that underlie this expedition. Judging from the expansive list of books Smith includes in his game-designing bibliography, this would appear to be worthwhile. In preparation, the author has studied everything from David Leeming's *Mythology* to Norman Mailer's *Ancient Evenings*.

For most keyboard explorers, including myself, this full length epic is no one-sitting pushover. But I'm sure there are a few experts in the audience who could cruise through this contest without working up a sweat. I've heard all about you guys. You're the ones who broke the *Zork* trilogy over breakfast, and then eliminated the *Ultima* series before noon.

Okay, I'm impressed. And I doubt if any excursion contained on this disk will stump a specialist with your adeptness. So now I give you a new option. If you know all the tricks—the intricate in's and out's of predesigned dilemmas, the gamut of giveaways and simple strategic solutions—then put them to work in a new dimension. Instead of picking apart these prefab fantasies, why not build one?

For this is the beauty of the *Adventure Construction Set*: the opportunity to put your creative impulses to work, transforming mischievous brain waves into personal puzzles. Here, all the world is a stage and you are the director. Everything is under your control, from the shapes and dispositions of roaming creatures, to the placement and power of curses and spells, to the ever-changing physical makeup of your terrain. And the potential magnitude of your creations is staggering. With imagination your only restraint you can actually develop a game with 240 different rooms (screens) using up to 500 unique creatures surrounded by 8500 distinct props, all acting and reacting as you please.

The *Construction Set* comes packed with articles of every possible pattern, with beings from every known and unknown race (look closely for characters from *M.U.L.E.*, *Archon*, *Adept*, and *Murder on the Zinderneuf*). And even if you can't find anyone from this massive cast to fit your needs, everyone and everything can be customized and overhauled to meet your specifications.

The program is menu-driven and joystick controlled, making for uncomplicated use, whether you are modifying one of the eight adventures included on the disk, or building a masterpiece from scratch. Any dedicated designer can work for months perfecting his universe; composing music, setting hidden traps and burying treasures. Or, for the less ambitious, there is always the option of letting the computer finish what you started. Just designate the mood, challenge, and goal of your crusade, and the machine will do the rest.

I can't help but enjoy any program that stirs my creative juices, forcing me to think and work in a personalized frame. And if that energy can be elicited in an entertaining, enjoyable way (which *Adventure Construction Set* does so well), the product becomes that much better.

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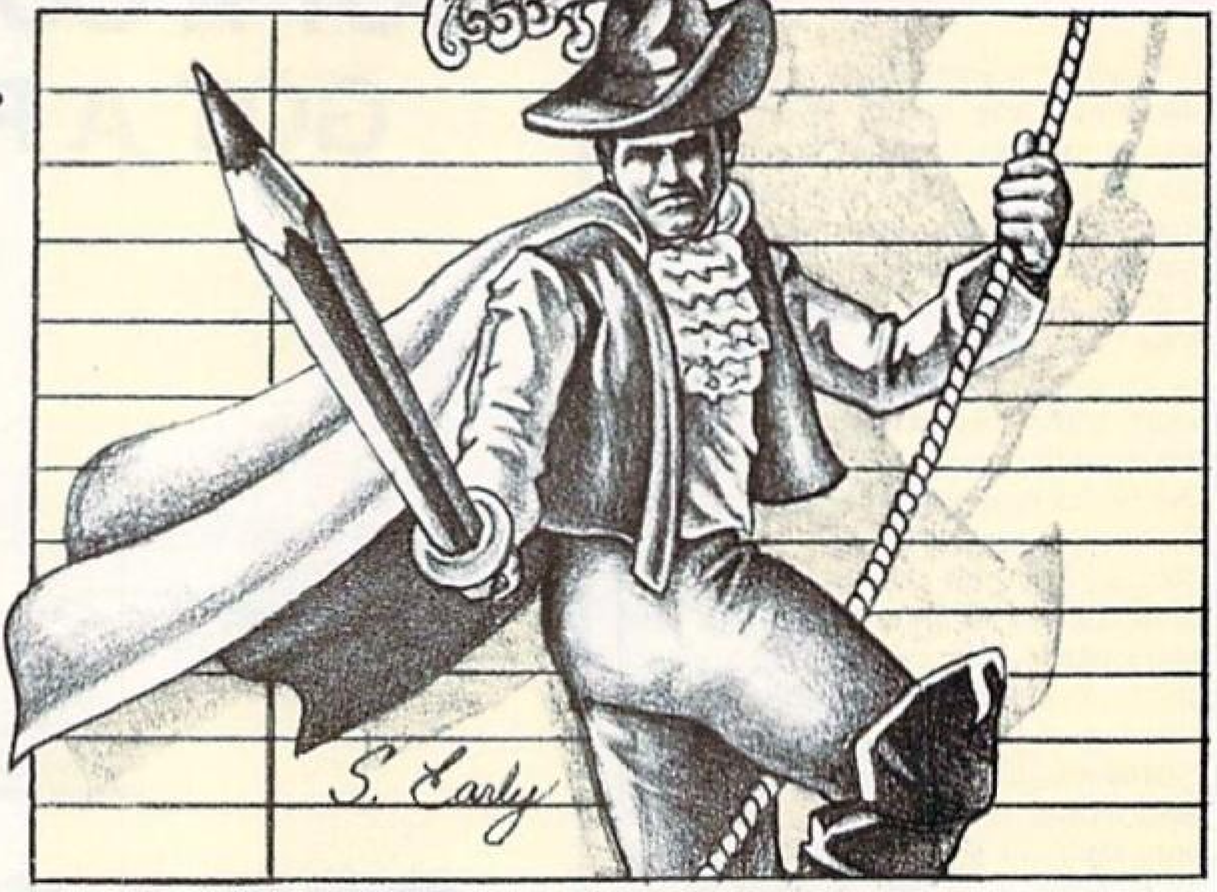
Circle Reader Service

REVIEWED BY DONALD GRAHAM

Adventurewriter

Computer: Commodore 64
Publisher: Codewriter
7847 N. Caldwell Avenue
Niles, IL 60648
Medium: Disk



Be careful. If you really enjoy playing adventure games, then this product may not be your cup of tea. If, however, you think you'd enjoy creating your very own adventures to your own specifications, then don't pass up *Adventurewriter*. This is another system in the Codewriter series that allows easy creation of complex programs, all the while relieving the user of the responsibility of actually writing the program.

Before describing *Adventurewriter*, let me first discuss some of the concepts of writing an adventure game. By its nature, an adventure program must systematically manipulate a base of data through the commands of the player. This manipulation is handled in BASIC largely through the use of arrays. Arrays keep track of objects and player locations, legal movements and inventories of items carried by the player. While arrays are most appropriate for keeping tabs on all of these parameters, they are not so easy to program and accurately maintain. It is this complex process of tracking and manipulating data that makes writing adventures in BASIC such a difficult task.

In addition to the data tracking, the program must be able to recognize or interpret the commands entered by the player, thereby simulating some level of intelligence. These commands must be parsed and processed by the program. Properly written adventure programs must deal with all of these elements and that takes some real programming skill.

Codewriter has answered this need to simplify the tracking and interpreting processes. Using *Adventurewriter*, you can simply state your requirements in each of several areas, (movement, legal commands and object control) and the software will write an adventure program for you in machine language format.

This format, however, is a little different from the other Codewriter products. In most of their other products, you are the user as well as the creator. You define your own needs and fulfill them with a custom application program that *you* will use. With *Adventurewriter*, however, you will be much less likely to play an adventure that you create, since you will already know the solution before you start playing the game. In this sense, *Adventurewriter* is more like *Dialog* (another Codewriter offering), because you are creating programs that someone else will ultimately use.

Adventurewriter comes with one disk and a 114-page instruction manual. As with their other products, Codewriter provides a complete one-year warranty for the disk, along with a promise of toll-free customer support and an optional back-up copy. As warranties go, this is better than most software companies provide. The disk and manual come in a book-style protective binder that fits very nicely on a bookshelf.

Now for a look at that manual. The instruction manual is divided into three major sections: an introduction, a tutorial and a reference section. In the introduction, you are first provided with guidance as to how to effectively use the manual. This is followed by a brief discussion of what an adventure program is all about. The third part of the introduction clearly explains how to get *Adventurewriter* started as well as what preliminary development work needs to be done before the adventure-writing process may begin. Also included are some suggestions for selling adventures that you create. It is a good approach to acquaint you with adventures and their development.

The tutorial division is the real meat of this manual, consisting of 70 pages of detailed instructions for the actual building of the adventure. A single scenario is presented and you are guided through all phases of development of the program. Everything is covered in this tutorial. It starts out with directions as to how to use the editor. The capabilities of the 64 are expanded somewhat in the editor to provide more flexibility in entering the commands and descriptions that you will need to develop.

Next, you are walked through the process of creating the data base for the adventure. You begin by creating descriptions of all of the locations to be used in the instructional game. After this, you are guided through the other parts of the data base. You are then shown how to expand and edit the data base. You can change object starting locations and messages and modify the status table. Each table you work with is described in detail along with its position in the overall working of the program, so you can fully understand how the adventure

Continued on pg. 126

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Circle Reader Service No. 33

REVIEWED BY JACK KAMMER

Kennedy Approach

Computer: Commodore 64
Publisher: MicroProse
120 Lakefront drive
Hunt Valley, MD 21030
Medium: Disk
Retail Price: $34.95

It's something like three-dimensional chess with SuperSonic Transports instead of kings and queens, 747's instead of knights on horses, and sluggish Cessnas instead of lowly pawns. But *Kennedy Approach*, the latest release from MicroProse, is more intense than chess; it is a simulation *par excellence*.

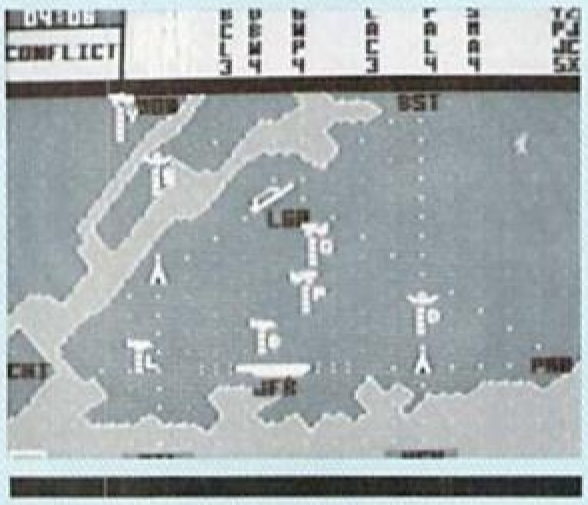
When airplanes below a certain altitude approach busy airports, they are required by federal regulation to contact Approach Control. The air traffic controller watches a radar screen and monitors the progress of each flight. It is his or her job to keep those planes away from each other by at least three miles if they are at the same altitude, or by 1,000 feet of altitude if they are within three miles.

Kennedy Approach gives your Commodore 64 the power to simulate not only the air traffic controller's radar screen, but also his or her radio communications with pilots.

Using an ingenious system of joystick and fire button, you quickly and conveniently send complex instructions to the planes appearing on your screen. To give a command, you move the cursor with your joystick to the plane's radar image, and press the fire button to lock onto that plane, moving the cursor up or down for altitude changes and left or right for changes in direction. Now press the fire button once again to transmit the message. Since planes sitting on the ground waiting for permission to take off have no radar image, you lock onto them by pressing their single-letter identifier on the keyboard.

When you transmit a command, always consisting of a compass heading and altitude, you actually hear it being transmitted to the plane, loud and clear, thanks to the spectacular voice synthesis of Electronic Speech Systems of Berkeley, California. Usually the pilot responds with a simple and efficient "Roger," but sometimes there are problems to announce: "United 817, emergency! Eight minutes fuel!" And hearing is believing.

> Kennedy Approach *gives your 64 the power to simulate not only the air traffic controller's radar screen, but also his or her two-way communications with pilots.*



JFK International Airport's Approach is only one of five Approach Control centers this game simulates. On your way to the top, you must start in Atlanta, move on to Dallas-Fort Worth, proceed to Denver, and then show your stuff in Washington, D.C. before opening your show in the Big Apple.

After you choose a skill level from one to five, you pick a shift at an airport that will challenge the skill you claim to have. A slow graveyard shift at Kennedy, for example, demands the same skill level as a relatively hectic morning in Atlanta.

Often there may be a nearby smaller, general aviation field cluttering the sky with snail-paced private planes on sightseeing and local flights. At the top of your screen, you'll see abbreviated flight plans for up to 26 planes telling you who started where, their current altitudes, who is waiting to take off, and where they all want to go. Sometimes a plane will want only to fly through your area on its way to another city, but more often than not, it's up to you to steer it clear of all other planes in the area and bring it in for a landing.

A safe landing. Not only safe, but safe in accordance with all applicable regulations, or you just might find yourself catching a flight back to Mama in Des Moines to help with the harvest. With hundreds of lives on the line, your bosses have no qualms about firing an inefficient air traffic controller.

For each ten-minute or quarter-hour playing segment, you can receive cash bonuses for good performance and be promoted as well. The simulation evaluates you favorably for your successful landings, proper departures and management of emergencies. What the bosses don't like to see are conflicts, in which you allow planes to encroach on each other's airspace, delays of planes waiting for take-off, improper departures (wrong direction or altitude) and, understandably enough, crashes.

When nothing is happening, you can press the space bar to speed the clock to double time. And if a skyful of planes isn't enough to keep your computer brain happy with simulation stimulation, *Kennedy Approach* can arrange to have a killer thunderstorm sweep across your airport, forcing you to send the radar blips in your care scurrying to safety.

The documentation is commendable for weaving factual information about the real world of air traffic control into its explanation of how to use the program. However, to save a few minutes of confusion, note this one thing. The screen shows each plane's altitude by displaying bars under the plane's icon. Each bar indicates 1,000 feet of altitude. The actual position of the plane is represented not by the icon, but by the bottom bar. The documentation falls a little short in explaining that point. Nevertheless, what it all adds up to is engrossing, intense and frenetic fun. ▪

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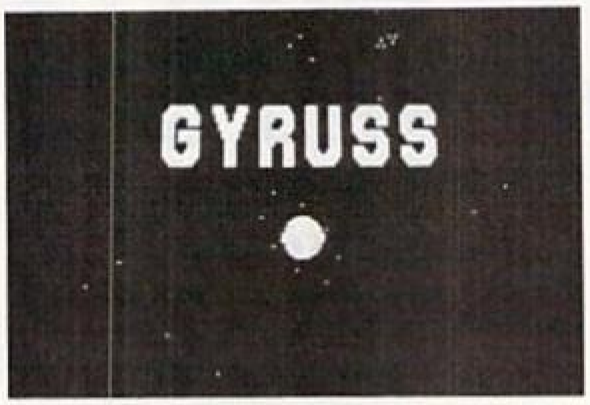
Circle Reader Service No. 13

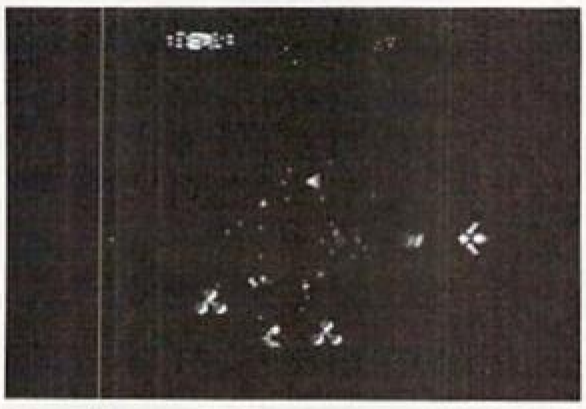
REVIEWED BY ROBERT W. BAKER

Gyruss

Computer: Commodore 64
Publisher: Parker Brothers
50 Dunham Road
Beverly, MA 01915
Medium: Disk/Cartridge
Retail Price: Not available



It's a tough flight and a shoot-out all the way, as you defeat wave after wave of enemy plane formations.



Here's a game for the Commodore 64 that I really enjoyed reviewing. You see, this is a home version of my favorite video arcade game, and it plays almost identically to the arcade version. It can be played as a one- or two-player game, with players alternating turns in the two-player mode.

The object of this game is to make the long journey from beyond Neptune back to the sanctuary of Earth. You'll have to defeat enemy planes while avoiding meteors and satellites along the way. It's a tough flight and a shoot-out all the way, as you defeat wave after wave of enemy plane formations. Stops at Neptune, Uranus, Saturn, Jupiter, and Mars mark your progression towards Earth. Each is a short visit, though, then it's off again to the next planet and the next wave of enemy planes.

Each screen tells you the number of warps to the next planet. Each warp is one stage of battle against the enemy planes that guard the planets of your destination. It takes two warps to reach Neptune, then three warps to reach each of the subsequent planets. There is a brief pause between each warp as your spaceship speeds towards the next planet.

Within each warp, you'll face four different formations of enemy planes. You fly in a circular pattern around the perimeter of the screen, controlling your position with the side-to-side motion of your joystick. The enemy formations usually emerge from the center of the screen where they band together and attack. Be careful though, they sometimes emerge from the side of the screen so they can create a surprise attack. In either case, you try to shoot down as many planes within the formation as you can without getting hit yourself.

After the last formation appears, all remaining planes regroup in the center of the screen and attack again. They'll continue to attack until you've eliminated them all, or you've been destroyed yourself. Besides trying to avoid being hit by the enemy planes, you also have to dodge their missiles, which you cannot destroy. But planes are not all you need to worry about; there are satellites and meteors, too.

There are two types of satellites. One type looks like a giant blue molecule or an orange globe, and they appear in groups of three. Shooting the middle satellite doubles your plane's fire power, giving you a double row of missles every time you shoot. This power stays with your ship until it's destroyed, and can be very important in later stages of the game.

The other type of satellite appears in pairs with a deadly energy wave between them. You'll have to shoot them down to break the wave or maneuver around them. Meteors look like large rocks that come flying directly at you. They cannot be destroyed, so be sure to stay clear of them.

If you complete the two or three warps to reach a planet, the planet appears on the screen. After a brief breather, you'll enter the chance stage. During this stage, there will be four enemy plane formations, one at a time, but they have no power to destroy you. Position yourself for maximum firing accuracy and try to destroy as many planes as possible. Bonus points are awarded at the end, with a special bonus awarded if all planes were destroyed. When the chance stage is over, it's off to the next planet.

You start the game with five planes and get an extra plane at 60,000 points, plus additional spaceships for every 100,000 points thereafter. You accumulate points for every enemy plane and satellite destroyed, with bonuses for each entire formation destroyed. Whenever you have double fire power, the molecular satellites count double.

The total score for both players is displayed at the top of the screen along with an indication of the current player's stage number. The stage number keeps track of the total number of warps and chance stages you've completed during the game, so you'll have some idea where you are in the game. Sound effects include the usual blasts and explosions along with an interesting background piece. You'll be listening to Johan Sebastian Bach's "Toccata and Fugue in D Minor."

As I said before, this is a home version of one of the latest video arcade games. The adaptation is very well done and should be a great addition to any home library. There are only a few minor deviations from the arcade version, with a few differences in the enemy plane flight patterns. Also, the arcade version gives you only three planes to start, but you get another at 30,000 points with additional planes for every 60,000 points thereafter.

The game itself is very easy to play, but difficult to master. Flight controls are simple enough for almost anyone. Graphics are good and give an illusion of motion, with great sound effects to match. The documentation is brief and to the point. All in all, this is one of my top choices for Commodore 64 game software. C

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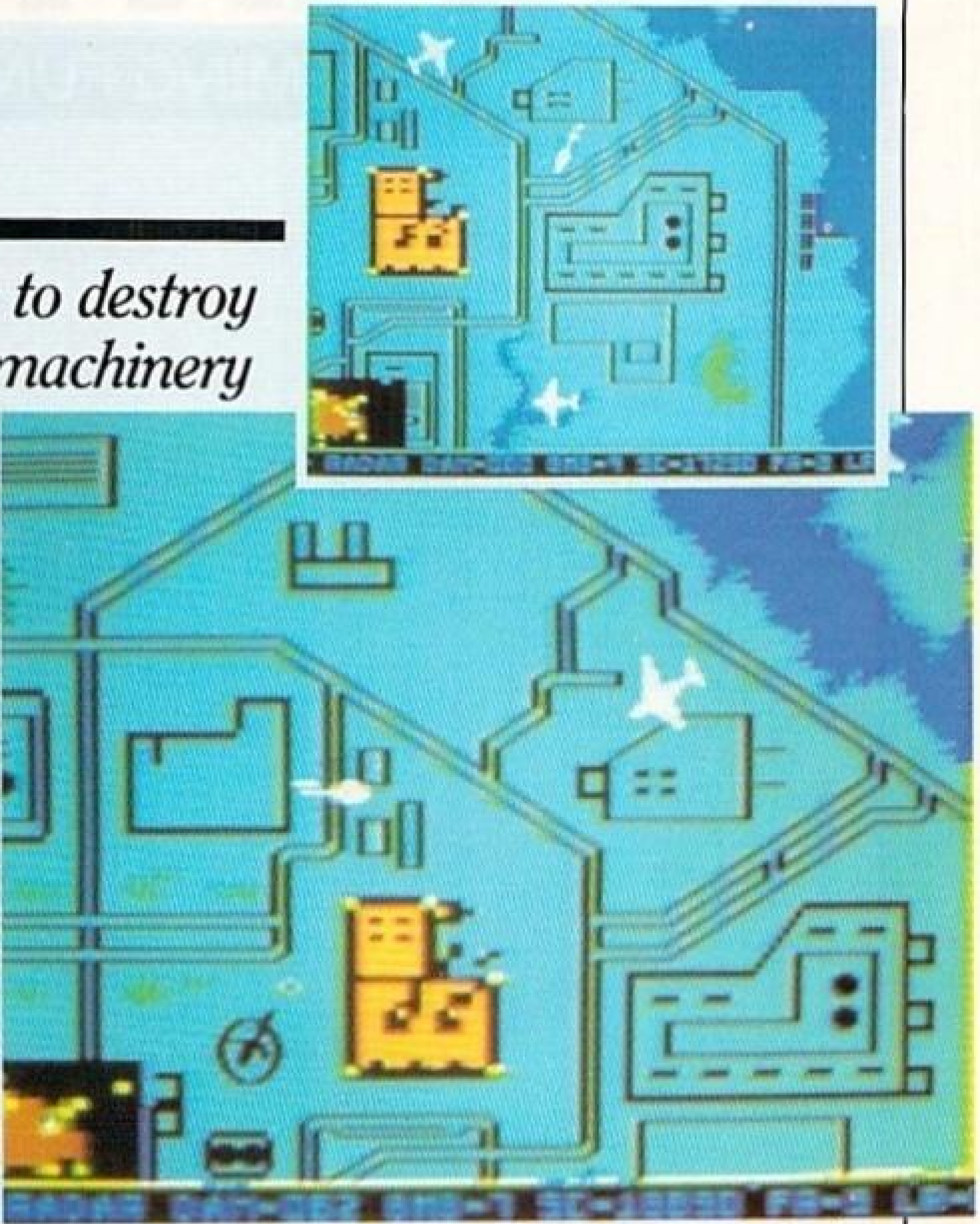
REVIEWED BY LENNY NELSON

Raid on Bungeling Bay

Computer: Commodore 64
Publisher: Broderbund
17 Paul Drive
San Rafael, CA 94903
Medium: Disk
Retail Price: $29.95

The object is to destroy all war machinery factories before you lose all five of your helicopters.



Past reconnaissance reports have shown the Bungeling Empire to be a powerful but peaceful society. Recently, however, satellite photos have revealed a massive mobilization of military machinery and the development of six new war machinery factories. Luckily, the capture of classified documents has allowed our government to get advance warning of an oncoming attack. They have also revealed that the Bungeling plan has but one flaw: Bungeling Bay.

It seems that in order to save time and resources, the Empire has built all six factories within a few miles of each other on a group of 12 islands within the bay. With careful planning and a little luck, a single assault helicopter can probably hit the factories before being detected. As the country's only hope, you will be taken into the bay by aircraft carrier and have five helicopters to complete the mission. But remember, you can only attack with one at a time to avoid detection. Here, time is of the essence: If you take too long, the Empire will be able to complete the construction of a large battleship. If this happens, it's only a matter of time before your aircraft carrier and remaining helicopters are sunk (unless you can sink the battleship first).

The object of *Raid on Bungeling Bay* is to destroy all six factories before you lose all five of your helicopters. A map accompanies the instruction manual which helps you locate the factories. On the islands, you will find two enemy airports, robot tanks, radar towers, and anti-aircraft guns. In the bay, you'll find small boats which fire at your helicopter.

The game screen consists of an aerial view of all the action. Included is a radar screen showing your position, a pointer to your aircraft carrier, helicopters left, factories left, score indicator and a damage indicator which goes from zero to 100. (If it reaches 100, your helicopter crashes.)

The instruction booklet references a total of 100 screens, although the most I could find was 80. While traveling along the scrolling screen, you are able to bomb any target on land or sea with your nine bombs (you can also use machine guns on some targets). When out of bombs, you must return to your carrier, land and load nine more bombs. Take heed here: On the island of Picdis, you will find an airport which houses a supply of bombs. To find the landing site, look at the game map where you can see letters along the outer edges. Notice at coordinates 10, 20, 36 and 72, the letters spell out R-A-I-D. Now follow each line to the point of intersection. This is the *only* area within the bay that you can land with the exception of the aircraft carrier.

While flying around bombing everything in sight, you meet a frustrating problem. You really didn't think it would be that easy, did you? Well, the problem, or problems I should say, are jet planes. These include black bombers which attack your carrier and white fighters which fire heat-seeking missiles at your helicopter. Either try to avoid the planes if possible, or destroy them before they leave the airports.

I couldn't find any real problems with this game except that it's only a one-player contest and there is no difficulty setting. But despite how good you think you are, don't expect to win this one in a couple of hours. It's not that easy.

Now for the reward. If you do manage to pull a victory, you'll be the subject of a newspaper article in the *Daily News*. The article will explain your triumph in detail and you'll even see the stock market rising because of it. Following the article, you will become the guest of honor in a graphic ticker tape parade.

Graphically and play-wise, this is a great game and will provide hours of pleasure. C

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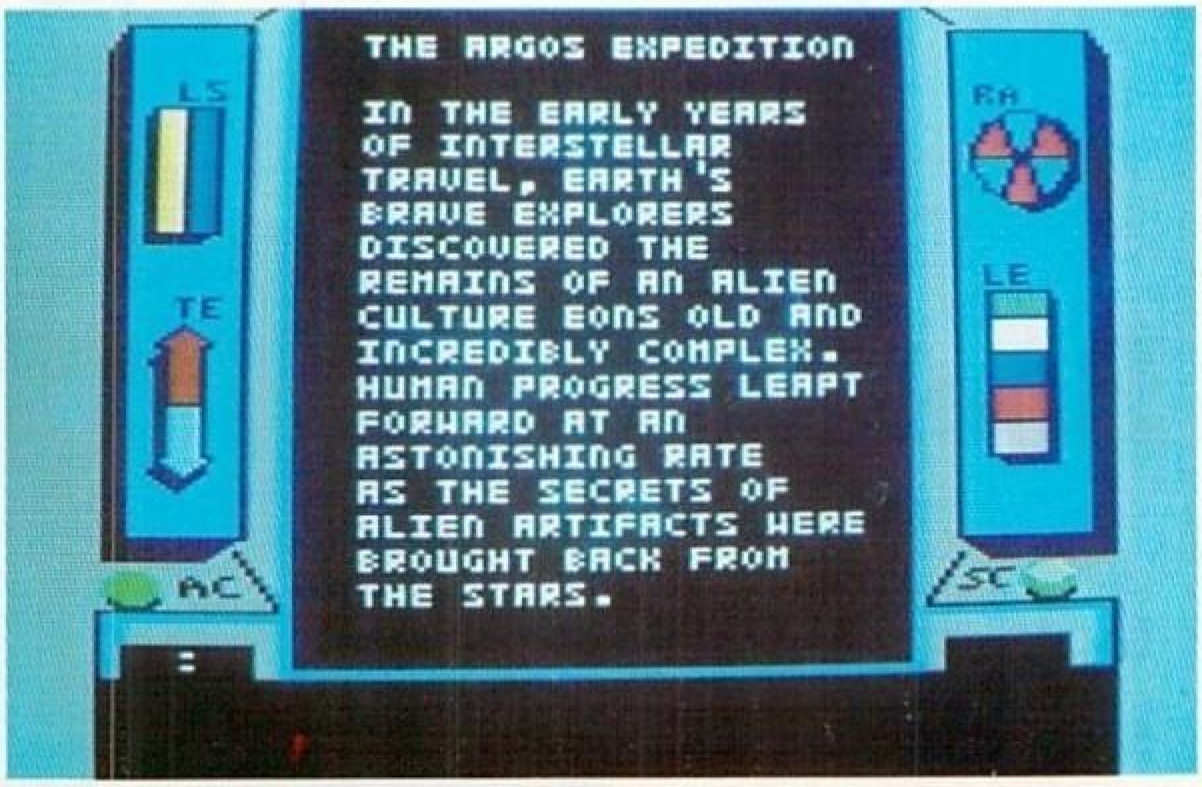
COMMODORE

DISKETTE BASED SOFTWARE
FOR YOUR COMMODORE 64

REVIEWED BY TOM BENFORD

The Argos Expedition

Computer: Commodore 64
Publisher: CBS Software
One Fawcett Place
Greenwich, CT 06836
Medium: Disk
Retail Price: $34.95



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THE ARGOS EXPEDITION

IN THE EARLY YEARS
OF INTERSTELLAR
TRAVEL, EARTH'S
BRAVE EXPLORERS
DISCOVERED THE
REMAINS OF AN ALIEN
CULTURE EONS OLD AND
INCREDIBLY COMPLEX.
HUMAN PROGRESS LEAPT
FORWARD AT AN
ASTONISHING RATE
AS THE SECRETS OF
ALIEN ARTIFACTS WERE
BROUGHT BACK FROM
THE STARS.
```

Argos Expedition is an adventure game for two to four players, ages ten and older, that takes place in outer space. The keyboard and joystick are both used in the two-player games, and the addition of paddles will accommodate third and fourth players.

The game is socially interactive rather than competitive, since players must function as a team and work cooperatively to achieve success. Developed by the Children's Television Workshop Software Group, this cooperative team approach adds a whole new dimension to playing adventure games.

In *Argos Expedition*, a group of players "journey" into space on a mission of exploration and experimentation. While hurtling through space, the players must function together as a team to travel, launch probes, negotiate hazards, and ultimately accomplish the mission.

On a more personal level, each "crew member" maintains a distinct identity and has a private goal that only he or she knows. Achieving these private goals rewards the players with credits, and the crew member with the most credits at the end of the mission is the winner. A deck of personal-goal cards is also supplied with the software, and these private goals are determined by drawing these cards.

Often, the players will have to choose between actions that are best for the group or for themselves. Frequently, selfish actions will adversely affect the overall success of the mission. This unique play factor effectively demonstrates the principles of cooperation for the common good and the benefits of responsible social behavior.

The overall scenario of *Argos Expedition* is to probe the depths of the galaxies searching for the remnants of ancient alien civilization. While this is the main theme in all games, each adventure is randomly-created by the computer within parameters selected by the players. These parameters include the size of the crew, the difficulty level of the mission, and its duration. Three difficulty levels are available and include basic, intermediate, and expert missions.

> *If a player puts his personal goals ahead of those of the overall mission, resounding failure inevitably results, and nobody wins.*

Argos Expedition is supplied on two disks. The first is the mission (program) disk, while the second is the artifact (variable data) disk. A comprehensive and well written 32-page flight manual is supplied with the software, and it fully explains the objectives, rules, play mechanics, and other pertinent information, in addition to giving the players some background information.

While the game is an adventure, it is *not* of the text genre. Text is used throughout the game to inform players of their status, play screens toggle between galactic maps, artifact maps, and gauge displays, but graphic displays of such space hazards as meteors, gravity warps, and wormholes liven up the game considerably. The video and audio portions of the game are also excellent.

The cooperative elements of *Argos Expedition* are particularly relevant when decisions are to be made that will affect the overall mission. For example, when selecting a destination to explore, all players must activate their control devices to finalize a decision. For a four-player game, this means the player at the keyboard must press the spacebar, the player with the joystick must hit the action button, and the remaining two players must depress the buttons on their paddles. No progress can be made in the game without collective agreement on destinations, objectives, and strategies.

The game is highly entertaining and has a strong element of continuing interest. More importantly, the benefits of working toward a common goal are not only taught, but effectively demonstrated. If a player puts his personal goals ahead of those of the overall mission, resounding failure inevitably results, and nobody wins.

Not only is the game fun, but it teaches the value of group cooperation. To top it all off, it makes computer gaming social. Who could ask for more? C

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REVIEWED BY MARK COTONE

Up 'n Down

Computer: Commodore 64
Publisher: Sega Enterprises
1230 Ave of the
Americas
New York, NY 10020
Medium: Disk
Retail Price: $34.99

The object of *Up 'n Down* is to traverse an array of highways and byways, avoiding road obstructions, to gather a series of flags. Your vehicle is a peppy two-door called a baja bug; a souped up version of the old Volkswagon. You don't actually steer this car; it stays between the guardrails without guidance. But your joystick input is needed for three other driving skills: to make right/left intersection choices, shift to forward or reverse, or jump. To jump, pivotal proficiency must be mastered to vault your vehicle skyward with a push of the controller button. You can hop in place, from point to point along a road, or from one path to another. In essence, this is not a race at all, but more of a moving obstacle course where a host of suicidal motor machines will stop at nothing to meet you by accident.

Your bouncing ability gives you a choice of two defenses. You can either avoid contact by sailing up and over the congestion, or you can pick up some extra points by timing your descent and landing directly atop your opposition. But leap off the road, or crash at ground level with any automotive antagonist, and you lose a car.

The roadways scroll from top to bottom, revealing strings of blacktop zig-zag. To make matters worse, all tracks are single lane, so it is imperative that you constantly keep alert for the many faces of danger. They'll come in the form of slow moving pickups and lethargic granny cars; virtual road blocks that create havoc by driving at inconsistent velocities. Then, after you master the art of downshifting, the more aggressive breed is released. Tanks, wedge cars, and toasters move at high speeds in attempts to squash your Beetle.

> *In essence, this is not a race at all, but more of a moving obstacle course where a host of suicidal motor machines will stop at nothing to meet you by accident.*

As you enter round three, there is a delightful addition in the form of a flag car. Planted in his rear bumper is a pole which flies one of the colored banners you need to acquire. Catch and crash him, and you gain that flag.

This traffic assortment keeps the game varied. Since each vehicle's characteristics differ so and their placement is randomized, you can never anticipate what's coming around the corner, and fail-safe patterns become impossible to devise.

The terrain is equally diversified, putting you against a landscape of fiendish design. Hills, valleys, bridges, intersections, dead ends, and canyons have all been incorporated, keeping you off balance throughout. And your car responds to the landscape. Try to ascend a steep incline at low speeds, and your engine may not be able to sustain the momentum; while on the downside, it would be wise to keep your brakes applied lest you go screaming full speed into disaster.

Each player starts with five cars, and receives a bonus auto at 10,000 and every 20,000 thereafter. There are three levels of difficulty, with eight rounds in each.

After you complete a round, a display will register how fast you finished. If your elapsed time is under 69 seconds, you receive bonus points depending upon your quickness. But a problem arises here concerning the grading system. Moving at full throttle, undetained by any obstruction, I have yet to clock any time below 57 seconds. But there are still three divisions of time and awards that start at 49 seconds. These levels seem unobtainable.

Sega also fails to inform first-time players about some basic game-playing elements. In the *Up 'n Down* instructions, for instance, you are left in the dark about the significance of the flag car, and there is never a mention of the scoring plateau. But don't let this steer you away. *Up 'n Down* is fast fun that requires precision and patience. The graphics are crisp, and the accompanying music light, quick, and appropriate.

Driver's Ed

Safety Tips On Unfamiliar Roads

There is no substitute for experience, so if you want to learn the in's and out's of *Up 'n Down*, play it a few times and get a feel for the road. Then, after you're comfortable, check out the hints listed below. They should help increase your score, and cut down on those insurance claims.

- If the position of the traffic before you is unfavorable, let the computer-controlled vehicles move off-screen. The program will not remember these groupings once they're out of sight.
- Probably due to the design of air brakes, you can control your baja bug, to a limited degree, *after* it is airborne. Use this feature to avoid danger, or to make pinpoint landings on a vehicle below.
- Although you can't jump while your car is in reverse, you can move your car backwards after you jump. Just inch forward slowly, and pull back on the stick as you spring skyward.
- Although the opposing vehicle position is randomized, the flag placement isn't. Everytime you play a particular round, the flags will be in the same position.
- Since the Bonus Chart doesn't seem relevant in its current format, don't be concerned about beating the clock. You can gain more points by taking the time to smash a few more vehicles.
- From the fifth level on, whenever you pass a pole of a banner you have already snatched, the flag will reappear, and you will lose credit. To avoid this additional headache, simply jump *any* post flying a white flag.

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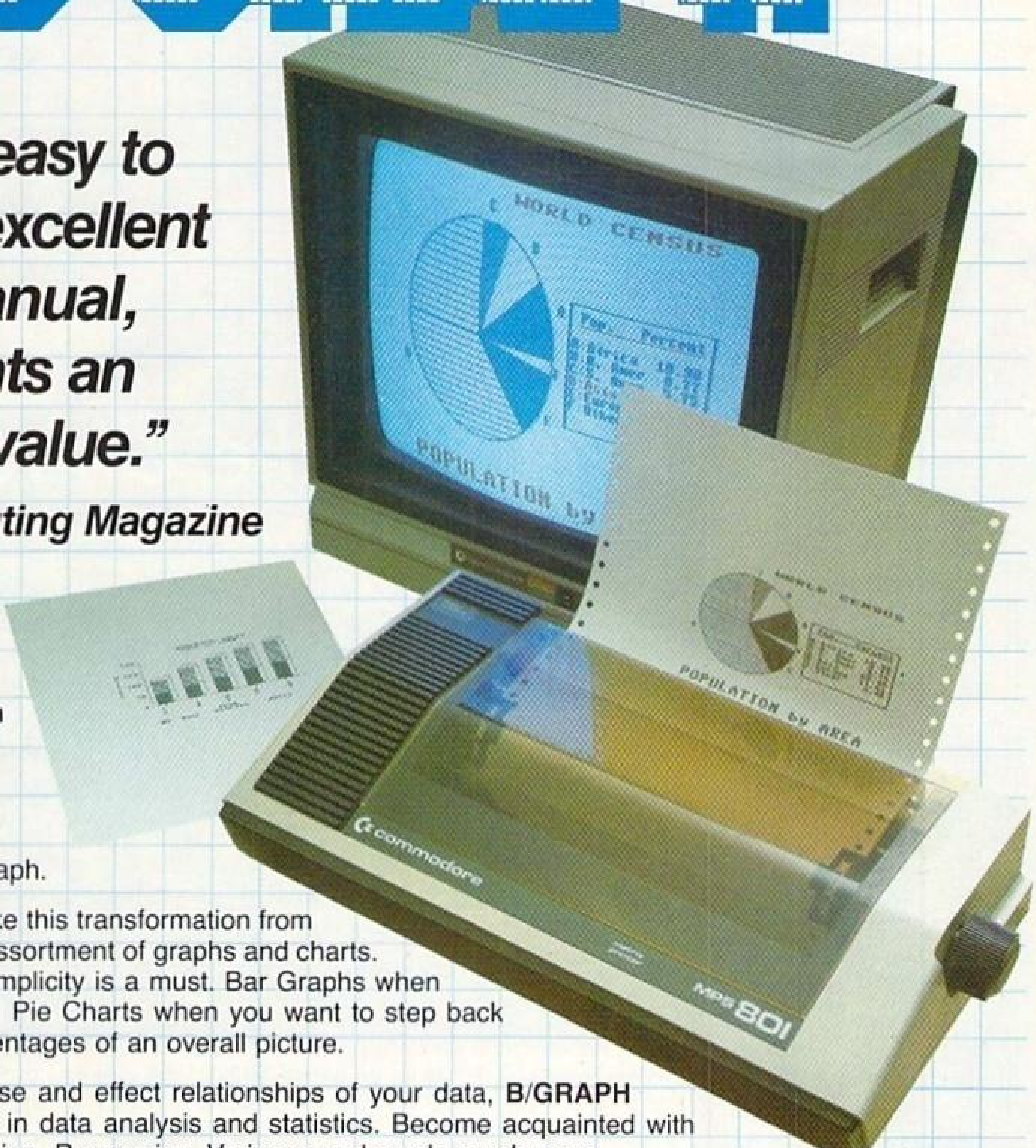

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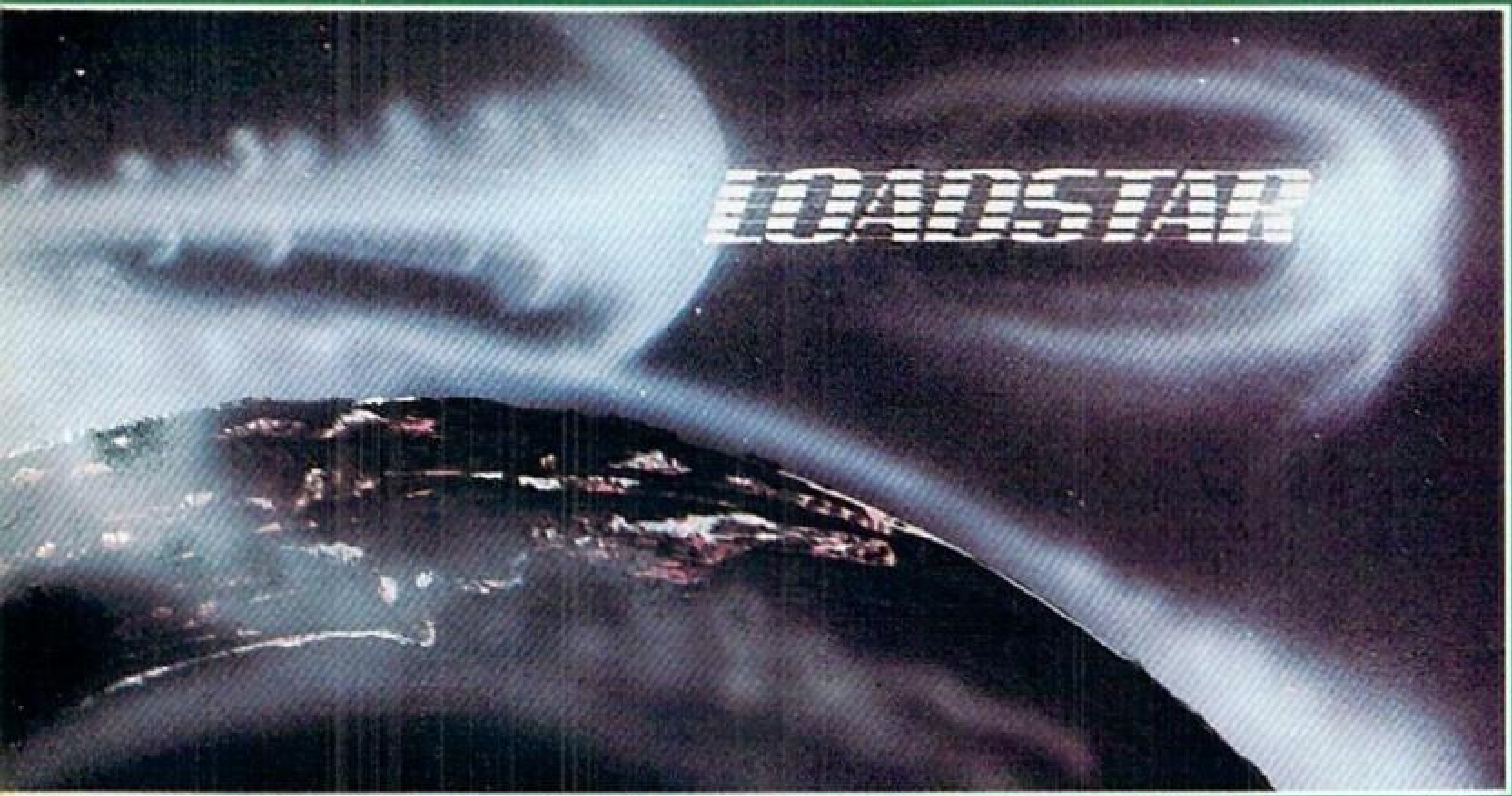

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REVIEWED BY GORDON B. OWENS

Jury Trial II

Computer: Commodore 64
Publisher: Navic Software
Box 14727
North Palm Beach, FL
33408
Medium: Disk
Retail Price: $49.00

How many times have you watched the People's Court and thought, wouldn't it be nice to, for just once, be a defending or prosecuting attorney? Now at last, for all of you armchair lawyers, is the game you've been waiting for. Navic Software's new courtroom strategy game *Jury Trial II* gives you Commodore 64 owners a chance to show what you're made of as you take part in a courtroom trial.

In this multi-player game, you don't play against any dull-witted computer, but rather you play against real flesh and blood, totally unpredictable human beings, with the computer acting as judge, jury and executioner.

As *Jury Trial II* begins, the computer asks the number of players, between two and six. The computer then makes random player assignments based on the number of players, with the exception of the two-player game, when player one is always the defense attorney and player two is always the prosecuting attorney.

The computer then brings various court dockets up so the prosecutor can choose a case. After the case selection, both attorneys meet with the sheriff to gather information about the suspect. The attorneys take turns questioning the sheriff. You don't always get the opportunity to finish with the sheriff, because you can only ask so many questions before the sheriff has to go back on duty.

> *A crime has been committed. The facts are in, the jury has been selected, and the trial is about to begin. It's your job to bring justice to this courtroom.*

With this in mind, you need to make the most of the questions you do ask. When questioning the sheriff, it's best if you keep your questions short—no longer than one and a half lines of text since he ignores anything over that, anyway. The type of questions that get the best response are specific questions dealing with things such as the suspect's clothes, car, and weapon. I've found that it's not necessary to ask long questions. For example, "What kind of car was he driving?" can be shortened to "car," or a question about the suspect's clothes can be shortened to just "clothes."

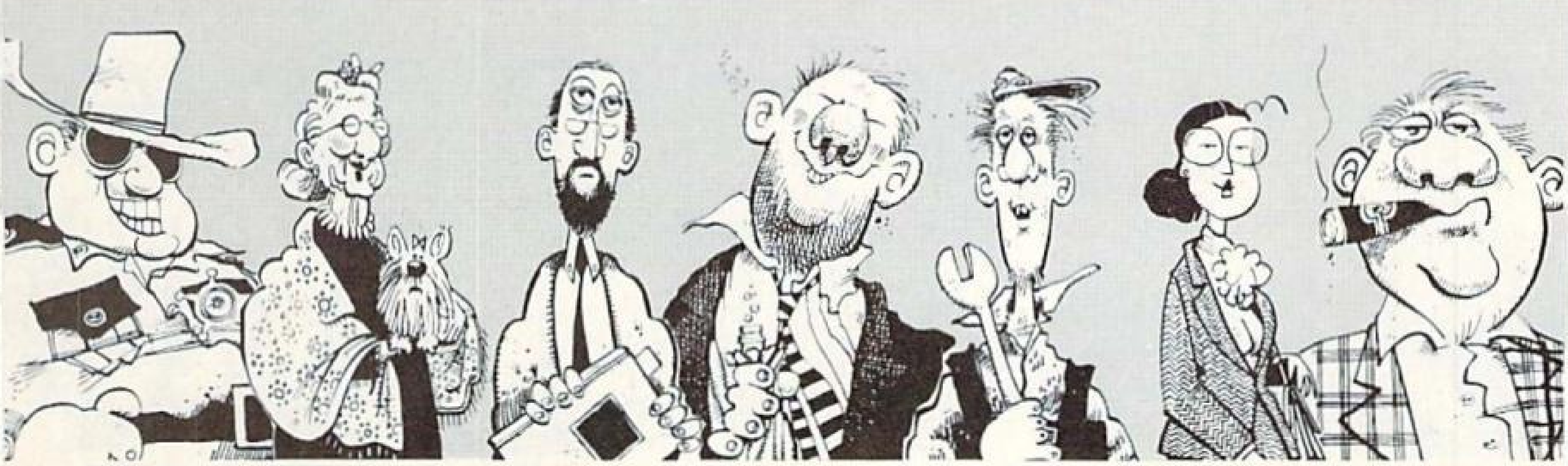
If you try asking the sheriff general questions like, "Is the suspect guilty?" you'll usually get a smart-alec answer. When the sheriff doesn't understand a question, he'll answer it senselessly or tell you that deputy Fuzz misplaced the report.

After your interview with the sheriff, you go onto one of the most important parts of the trial: jury selection. This is important because your whole case can hinge on how well you do in this part of the game.

The game provides you with a total of 12 prospective jurors, ranging from ordinary citizens to some of the most outrageous characters you can imagine. The jurors fit into three possible categories. First, there are those who lean toward either the prosecution or the defense. Second, those who are basically impartial, and third, the few jurors who are totally random. These are the ones who tend to jump back and forth between innocent and guilty verdicts.

When you are selecting jurors, the computer gives a general background on each person. In the program manual, there is also an extensive dossier on each prospective juror. I recommend that you study this carefully because this information can have a direct bearing on whom you select and whom you reject.

In jury selection, both attorneys are allowed three challenges. (This refers to the number of times you can reject a prospective juror.) After you have used all of your challenges, the opposing attorney can select the rest of the jury without any further interference from you. If both attorneys use all their challenges before the six-member jury selection is complete, the



THE SHERIFF
A Heap o' Trouble

ESMIRELDA EUBANK
Rose Colored Glasses

DR. DORFMANN
Quite Logical

R.V. WALLBANGER
Who's Worried?

RODNEY DORK
Transmissions? A Cinch

CONNIE POWERS
Woman's World

ARCHIBALD ARCHER
Love It or Leave It

computer finishes jury selection.

It's now time for the trial to begin. Each witness is called for five direct questions and five questions of cross examination by the opposing attorney. When a question appears at the top of the screen, the opposing attorney may object to the question by pressing the spacebar. Also, if a witness gives answers that go contrary to the sheriff's allegations, he or she will be cited for perjury and contempt of court.

At times, the witness will be asked to give a sworn affidavit in lieu of certain questions. When you are entering an affidavit, the INST/DEL key won't work, so you can't change the information once you've entered it. As a result, you need to have what you want to say already in mind.

The court looks at this affidavit in one of three ways. It can be thrown out as inadmissable, or it can score a point for either the prosecution or the defense. It's up to you to figure out how to use the affidavit in your favor. When the computer directs the witness to enter an affidavit, neither attorney can turn it aside or object to it.

After all of the witnesses have been heard, the defendant takes the stand. To question the defendant, both attorneys must formulate their own questions. The questions must be no longer than one and a half lines of text. During this part of the trial, no objections are permitted. The prosecution's questions should be designed to get a confession from the defendant. Questions like, "Are you guilty?" will only cause the defendant to "take the fifth." After both attorneys are finished questioning the defendant, the jury retires to consider the evidence and reach a verdict.

The game provides you with a total of 12 prospective jurors, ranging from ordinary citizens to some of the most outrageous characters you can imagine.

If the jury only lacks one for the unanimous verdict, then the other jurors may convince the stubborn holdout to change his or her vote. However, if there is more than one holdout, there will be a hung jury and the case will have to be tried again. If the jury finds the defendant innocent, the defendant is free to go. If the defendant is found guilty, the case can be appealed and retried.

While *Jury Trial II* is not intended to be a graphics game, it does have some interesting touches at the end of the game. If the defendant is found innocent, the courtroom doors appear, open, and a little stick man is seen waving goodbye. However, if the defendant is found guilty, a jail cell door appears and slowly closes.

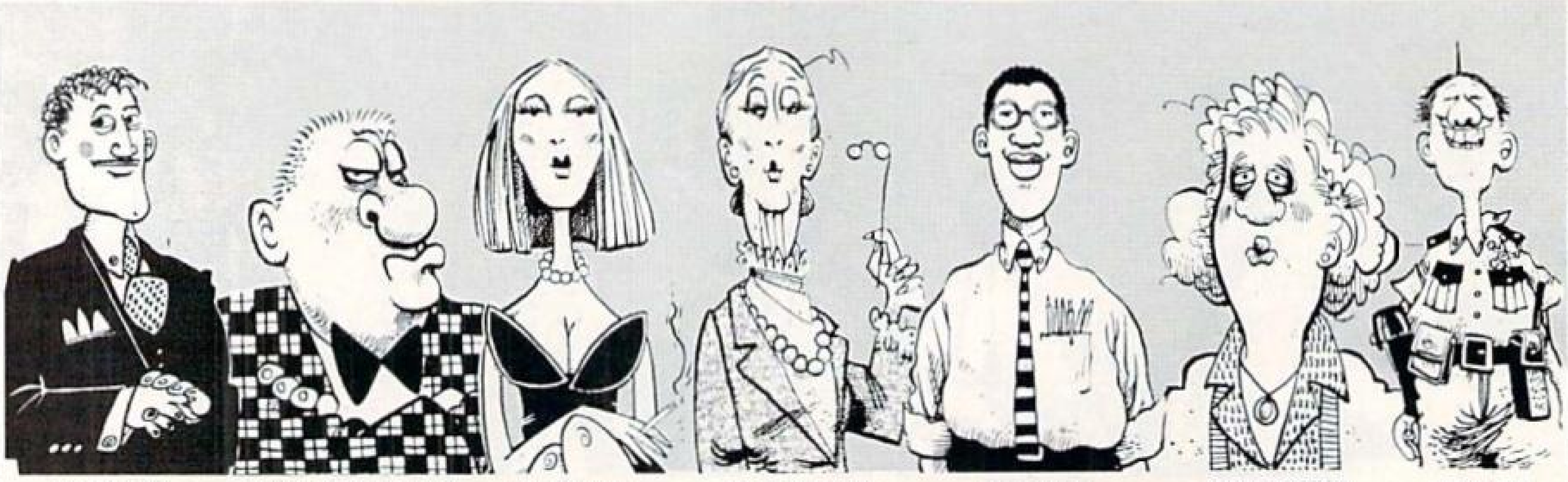
Jury Trial II comes with its own book-like storage case and a ten-page instruction manual that covers game objectives, initiating play, dealing with the sheriff, the trial, and the verdict. As I mentioned earlier, the manual also contains extensive information about the prospective jurors. But, although the manual does tell you how to go about prosecuting the defendant, it gives very little information on how to defend him. This omission makes it difficult at times if you are the defense attorney.

Other than that, I found the manual to be well written and the drawings of the jurors quite comical. The manual also states that no notes may be taken at anytime during the game. While I can understand the reasoning, I found the game to be more enjoyable if you do take notes, but use them only to plan strategy with your witnesses, and then put them away when the trial begins.

In playing *Jury Trial II*, I found some minor problems. First, when you are entering information for an affidavit, the program will stop printing what you are typing to the screen and then will suddenly print it out all at once. Also, when entering an affidavit, you have no cursor on the screen so you are not aware of where your next line of text will appear.

The advertisement bills *Jury Trial II* as a game for two or more players. However, I've found that the two-player game does not play as well as the multi-player game. In fact, I would have to say that *Jury Trial II* is a game that is best played with no less than four people.

Despite these minor problems, I think *Jury Trial II* can be enjoyed by anyone who has ever wanted to experience the thrill of courtroom drama firsthand without ever going to law school.



J.R. CARTRIGHT Go For The Gold

BRUTUS (THE BRUTE) HAWGG Good Ole Boy

LOLITA LAVERNE Va Va Voom!!

LOUELLA VAN SMYTH No Time For Trifles

CONRAD WHITE Straight Arrow

BARBARA BIGELOW Sweet Revenge

DEPUTY FUZZ More Trouble

WHAT IS THIS GIRL DOING?

	THE			GIRL				IS
TH	AX	PAS	GG3	ER2	LL	PAS	IH	SS
29	15	04	34	52	45	04	12	55

				FEEDING				
PAS	FF	IY	PA3	OO2	IH	NG	PAS	BB1
04	40	19	02	33	12	44	04	28

			BREAD				TO
RR1	EH	EH	PA1	OO1	PAS	TT2	UW2
14	07	07	00	21	04	13	31

		A			DUCK	
PAS	EY	PAS	OO2	AA	KK2	PAS
04	20	04	33	24	41	04

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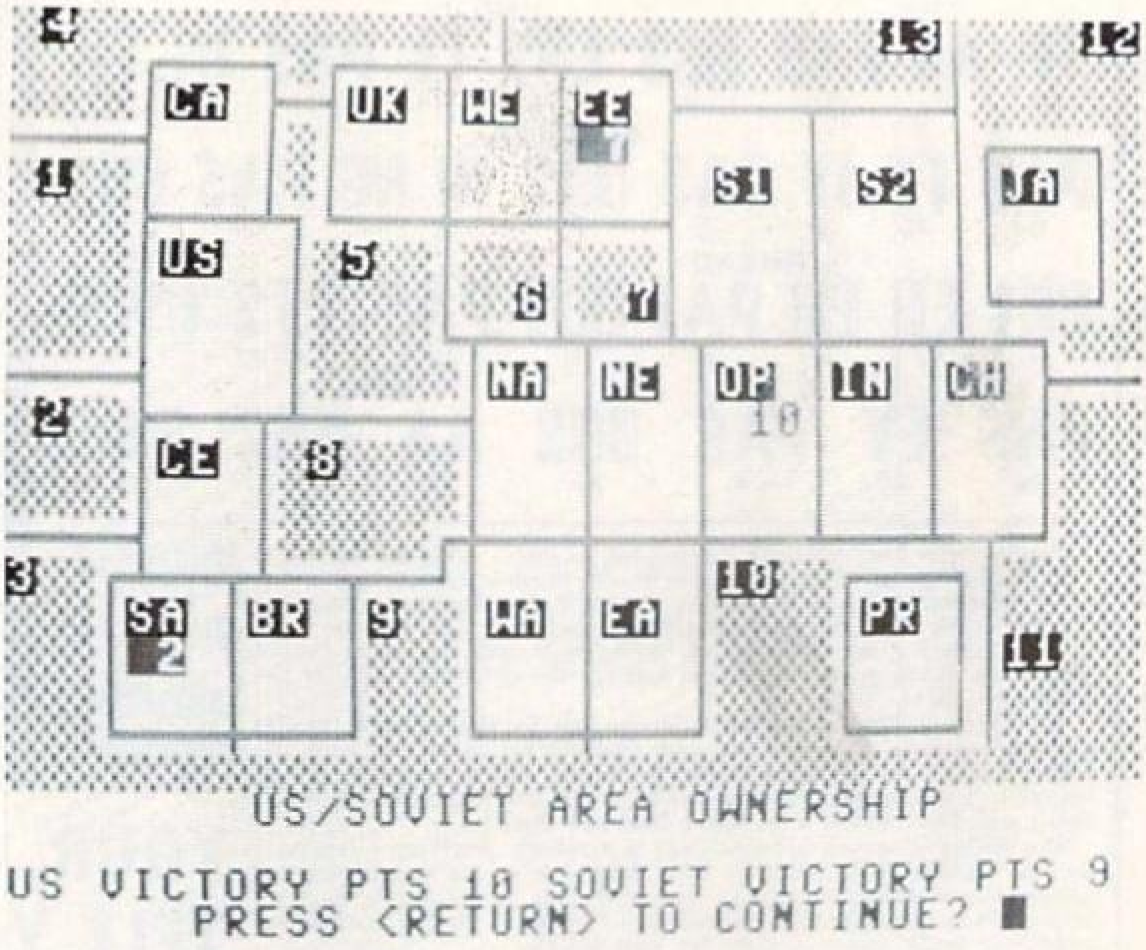
REVIEWED BY JEFF SEIKEN

Geopolitique 1990

Computer: Commodore 64
Publisher: Strategic Simulations
883 Stierlin Road
Mountain View, CA
94043
Medium: Disk
Retail Price: $39.95



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US/SOVIET AREA OWNERSHIP
US VICTORY PTS 10 SOVIET VICTORY PTS 9
      PRESS <RETURN> TO CONTINUE? █
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It is almost impossible today to pick up a newspaper or turn on the news without seeing an analysis or criticism of our foreign policy. For the armchair expert who feels he could do better, *Geopolitique 1990* provides that opportunity, propelling the player from the comfort of the armchair into the president's seat in the Oval Office.

Geopolitique 1990 is a game of economics, politics, and warfare between the two superpowers, the United States and the Soviet Union. This struggle for global supremacy is waged across a stylized world map arranged into 19 land areas and 13 ocean areas. The 19 land areas (except for the U.S. and U.S.S.R.) represent individual or groups of minor countries of vital interest to the Americans and Soviets. The game can only be played solitaire; the human player controls the United States and the computer dictates the Soviet Union.

At the beginning of *Geopolitique 1990*, you must first prioritize three national objectives—gross national product, prestige, and national security. The computer does the same for the U.S.S.R, although this information remains secret, and you will only be informed of it when 90% of the Soviet goal in a given category has been reached.

The computer also assigns three leaders from a pool of 15 to the Soviet Politburo (roughly equivalent to the United States President and Cabinet). The player reference card includes a brief "dossier" on each leader, outlining his negotiating ability and economic orientation. These attributes determine the Soviet's strategy. Periodically, new Soviet leaders will be appointed to the Politburo, replacing those who have fallen from grace. Usually, it is possible to detect general trends in U.S.S.R. actions, and the composition of the Politburo can serve as an important indicator when you are formulating your strategy.

The game can only be played solitaire; the human controls the United States.

Each turn of *Geopolitique 1990* consists of six phases. The first phase is purely informational, providing an update on the U.S. and U.S.S.R. This phase also presents the status of minor countries—either unaligned, pro-U.S./U.S.S.R., or very pro-U.S./U.S.S.R.,—as well as all agreements either superpower has with any minor country. Additionally, you can declare war at this time, or the computer can choose to declare war for the Soviets.

In the economics decision phase, you allocate the U.S. economy for the production of four types of goods. Military maintenance points permit existing military units to continue to operate, military mobilization points create new units and industrial points add to the U.S. industrial capacity. Of greatest importance, however, are the political action points (PAP) which are used to gain the right to negotiate with the minor countries.

The third phase involves the placement of task forces in any ocean area. Each task force is composed of three military units and these are used to influence and intimidate minor countries. In real-life terms, this would be equivalent to the U.S. dispatching the Sixth Fleet to the Red Sea during a Middle East crisis to act as both a deterrent and a show of arms.

During the fourth phase, the U.S. player places PAP's in minor countries where he or she wants to conduct negotiations. A maximum of two can be placed in any particular minor country, and U.S. and Soviet PAP's cancel each other out on a one-for-one basis. For instance, if the U.S. placed two PAP's and the U.S.S.R. placed one in Central America, the net result would be one remaining American PAP, thereby allowing the U.S. to negotiate with Central America in the following phase.

The last two phases, the U.S. and Soviet minor negotiation phases, are the most critical segments of the

Continued on pg. 38

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game. With each minor country in which a PAP was previously placed, the owning superpower can seek to arrange an economic, political, military, or neutrality agreement. Each type of agreement carries with it certain benefits. Economic agreements give that superpower access to the raw materials and industry of the minor country, military agreements boost national security, political agreements provide a prestige bonus, and neutrality agreements cancel all existing agreements of either side with that minor country. Reaching any sort of agreement also results in a prestige gain while unsuccessful negotiations cause a drop.

When conducting a negotiation, the U.S. player must select the degree of pressure to exert on the minor, ranging from a peaceful request all the way up to a military threat. The minor's reply will depend on a variety of factors, such as the U.S./U.S.S.R. prestige levels relative to each other, and the presence of task forces in adjacent ocean areas. The response can vary from outright acceptance to complete rejection or something in between the two.

In event of the latter, another round of negotiations must be conducted, with the limiting stipulation that the same or higher degree of pressure must be exerted. In other words, the U.S. cannot back down from a strong demand to a strong request. Prestige gains or losses depend on the level of negotiations—at levels where high degrees of pressure are being exerted, a correspondingly greater amount of prestige is at stake. The U.S.S.R. may also gain or lose prestige during U.S. negotiations depending on whether or not the minor country involved represents an area of interest to the other superpower.

Finally, if negotiations are unsuccessful, you may launch a limited war and attempt to secure by force what could not be attained by more peaceful methods. After all of the U.S. negotiations are completed, the computer then reports the results of the Soviet negotiations.

Apart from the normal routine, at irregular intervals random events flash across the bottom of the computer screen AP news-style, possibly upsetting the current status quo. These events, such as the overthrow of a minor country's government or the downing of a U.S. spy plane over the Soviet Union, can affect a superpower's prestige, the attitude of minor countries and the possibility of war.

> Geopolitique 1990 *propels the player from the comfort of the armchair into the president's seat in the Oval Office.*

Also, at the end of every turn, you have the option to put any world crisis on hold and save the game on a formatted disk. However, this feature suffers from one annoying flaw: When a game is saved, the results of the last played turn, in terms of changes in gross national product, prestige, and national security levels will not be known since this information is available only at the start of a turn. It is even possible to save a game that has, in fact, already been won or lost.

Playing *Geopolitique 1990* is fun, absorbing, and, above all, challenging. Not surprisingly, the key to winning the game hinges on one's ability to negotiate. As in the world today, the United States cannot allow itself to become isolated. In game terms, this translates into successfully concluding agreements with minor countries so as to fulfill the U.S. objectives set at the beginning of the game.

The art of negotiation in *Geopolitique 1990*, however, can be a difficult skill to master. Inexperienced players will more likely than not find themselves frustrated in their attempts to reach a desired agreement with the often fickle minor countries. In addition, as minors are far less inclined to submit to any demand from a superpower with a lower prestige level than its rival, the losses in prestige due to failed negotiations will hinder all subsequent negotiating attempts. Thus, several unsuccessful rounds at the bargaining table can trap the player in a downward spiral that is difficult or impossible to reverse.

Of course, like the real world, war between the superpowers remains an ever-present possibility. You can declare war at the beginning of any turn. The likelihood of the U.S.S.R. starting a war depends on the world tension level. Certain actions, such as fighting a limited war or demobilizing military units, can raise or lower the world tension level, which varies between I (war extremely doubtful) to IV (war seen as inevitable).

Should war break out, it is fought solely with conventional weapons represented by armies, fleets and airpoints. Political and economic goals take a back seat and victory revolves around capturing land areas worth a total of 60 points, although a successful attack on the U.S. mainland results in an automatic U.S.S.R. win.

This part of the program, which is called Geo-War, does a very nice job of simulating warfare on a global scale. You face the problems of having to transport units across great distances to support far-flung combat theaters while the U.S.S.R. possesses the distinct advantage of interior lines of communication. (For instance, starting from the U.S.S.R., a Soviet army can reach almost any point in Europe, Africa or Asia by land within two moves.) Air power also plays a decisive role in the struggle, not only for the purposes of winning battles but also for ensuring that reinforcements reach their intended destination.

My only complaint with Geo-War is that it is simply not as much fun as the political part of *Geopolitique 1990*. Turns generally proceed at a slower pace and the computer seems to present an endless series of screen updates. Thankfully, the game penalizes the superpower that initiates the hostilities. The aggressor has fewer minor country allies as a result of negative world opinion, and this tends to make starting World War III a less attractive option for either superpower, except as a last resort.

Geopolitique 1990 can be played at four different skill levels and also contains seven scenarios. Each scenario postulates a certain initial world situation, such as an isolated United States confronting pro-Soviet regimes in Latin and North America. All of the

Continued on pg. 126

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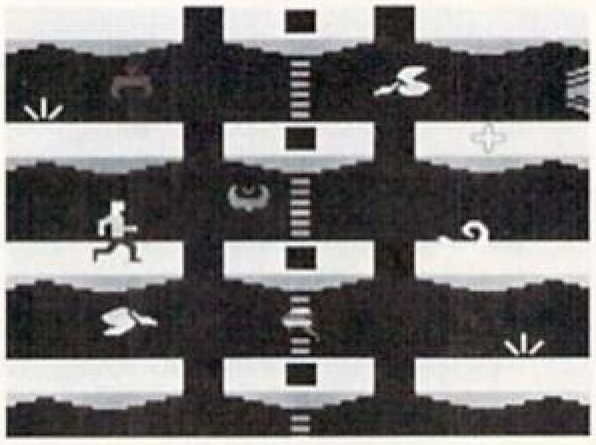
Pitfall II

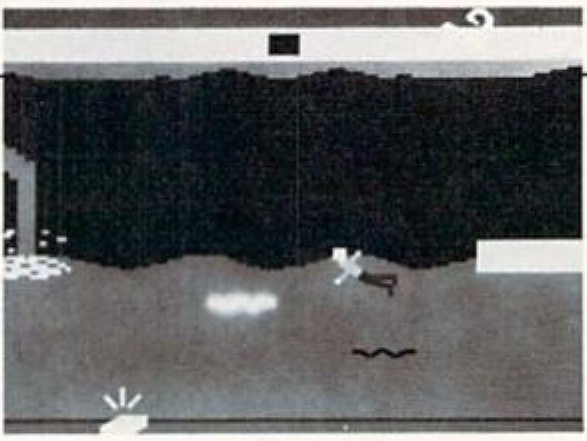
Computer: Commodore 64
Publisher: Activision
2350 Bayshore
Frontage Rd.
Mountain View, CA
94043
Medium: Disk
Retail Price: $29.95

Even if you're a gamer who's never guided Pitfall Harry, you'll thrill at the excitement, challenge, and diversity in this award-winning action adventure game. Those already familiar with it will still get a kick (and possibly a bite or two) from this horde-the-treasures and avoid-the-hazards free-for-all.

The Commodore 64 rendition retains most of the original's visual effects, though they've been tightened up, shaken down, and otherwise refined. Activision keeps its conversions similar in looks, play action, and audio antics as they cross the technological line from machine to machine. This commonality ensures that *Pitfall II* will reward players with precisely the same action and adventure no matter what "theater" it's in.

Don't blame Activision if you get suspended from school or lose your job due to all-nighters spent questing for fabulous fortunes and adventure.





With that in mind, don't expect to see a lot of new things. It just won't happen. In reality that's good news, though, for *Pitfall II* symbolizes a way of life: footloose, fancy free, living in the fast lane. That kind of existence doesn't need much improvement.

If 20 minutes on the game clock gives you some idea the heat's on, right you are. Gamers use a joystick to guide the amiable explorer through screen after screen of crocodile-infested, snake-bound, scorpion-littered jungle. Underground passages contain their own drawbacks, including (inexplicably) brick walls which deter further travel.

Back to the upper crust and a gaggle of sturdy vines it is then. Swinging from tendril to tendril, players risk their necks with ill-timed leaps leading to fatal falls. Pick up gold bars and

Beamrider

Computer: Commodore 64
Publisher: Activision.
2350 Bayshore
Frontage Rd.
Mountain View, CA
94043
Medium: Disk
Retail Price: $29.95

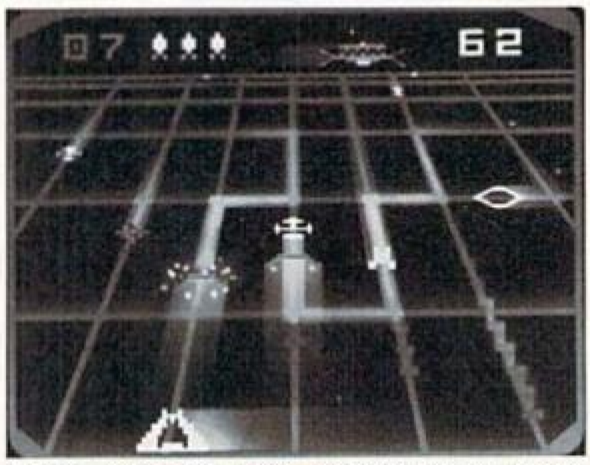
In this space blast-a-thon, you are launched in an unprotected light ship from the bowels of a space station to do battle amongst the woof and warp of a 99-sector grid encircling Mother Earth and travel horizontally along a blue beam located at the lower edge of the video screen. Fifteen enemy spacecraft per level, assorted piles of debris and miscellaneous alien obstacles blaze down the simulated three-dimensional net trying to send you nowhere fast.

Not only do these objects play collision courses, they shoot back. Red energy squares (launched by the saucers) can be particularly difficult to spot amidst the items flashing by at near warp speeds. The closer anything gets, the faster it goes. The realism is outstanding.

Space jockeys really have to be on their toes to free the Big Blue Marble from evil tyranny.

Players depress the fire button to dispatch laser lariats capable of destroying most, but not all, of the enemy arsenal. Space rocks, for instance, are impervious to the futuristic firepower. Replacement craft whisk down the rotating beams, too. Docking with them earns extra lives and better bonuses.

Pushing the joystick forward while the action button's activated lets loose up to three torpedoes. These electromechanical marvels, used primarily for knocking out end-of-round Sector Sentinels, are good against anything. In a bind, they'll clear a path through normally invincible objects, though fast hands and keen eyes are by far the best long-term defenses.



The first few rounds are nothing more than an appetizer before the main course. This slow build-up is meant to prepare you for the coming onslaught. Every second round, up to and including the fourteenth, sees the addition of a new type of threat. Blocker ships, tracking vessels, space junk, and bouncing beam hoppers are just several of the many terrors you'll encounter in the vast wasteland high above the earth. Space jockeys really have to be on their toes to free the Big Blue Marble from the evil tyranny which has enveloped it.

Though the audio effects are mini-

REVIEWED BY TED SALAMONE

sacks full of cash while winding your way around deadly campfires and time-robbing rolling logs. Waltz across close-mouthed crocodiles (be quick about it though), leap disappearing pits and ponds, jump, duck and dodge other obstacles in this high-resolution, multi-colored challenge.

Timing is of the utmost importance in mastering this game. All activities require the split-second precision acquired after repeated play. This isn't much of a problem, since you'll be addicted to it so fast, the hours will fly by like swallows returning to Capistrano. Also, don't blame Activision (or me) if you get suspended from school or lose your job due to all-nighters spent questing for fabulous fortunes and high adventure.

Pitfall II's sound effects are less than state of the art for the 64. All the marbles have been put into the remarkably lifelike animation and play mechanics, a choice one can hardly find fault with.

Overall, *Pitfall II* for the 64 provides a world of excitement and hours of gaming entertainment.

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mal, being limited to warnings and explosions, they are vibrant and highly resonant. Lingering, they vibrate like sound waves from a low-pitched tuning fork. The utter destruction of a saucer sounds as if it came from a Star Wars flick.

Graphically speaking, this game is an improvement over all the other versions. Major changes can be seen in the style and substance of the advanced nuisances as well as the Sector Sentinel itself. Enhanced use of color and attention to bit-mapped detail make it visually one of the best computer games ever derived from a dedicated videogame.

Since the play's the thing (just ask any angler), let's examine vessel/joystick control. The light ship glides back and forth spewing death and destruction at the twist of the stick and the touch of a button. Movement is fluid, unlimited; fast action firepower is yours for the asking.

Fortunately, there are no problems: bit, small, or otherwise. Activision's *Beamrider* for the 64 offers hair-raising excitement and non-stop action. Get with it, get on the beam!

REVIEWED BY TOM BENFORD

Tournament Tennis

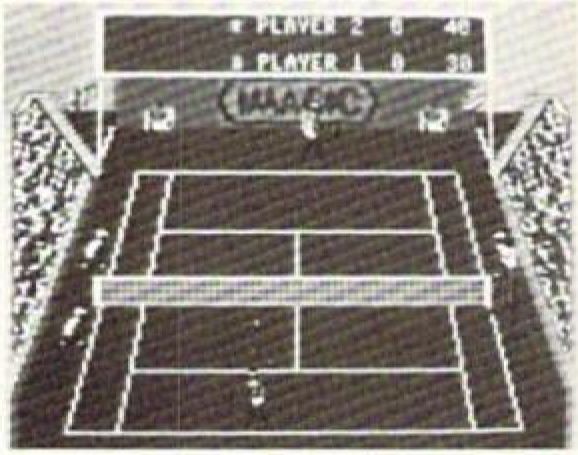
Computer: Commodore 64
Publisher: Imagic
2400 Bayshore
Frontage Rd.
Mountain View, CA
94043
Medium: Disk
Retail Price: $34.95

In *Tournament Tennis*, you may choose a one-player, two-player, or demonstration game. In demo mode, the 64 plays itself and puts on a match that illustrates the program's capabilities. In a one-player game, you volley and counter against the computer, while two-player mode invokes head-to-head action with another live player. A word to the wise is in order here: The 64 is a devastating opponent and uses every cutthroat tactic to win the match. Keep that in mind when in a one-player game and never underestimate your computer.

When you play against the computer, choose from three levels: novice, amateur and pro. In the novice level, the computer opponent is a passive player, returning the ball in your direction each time. This is a great level to start with, because it gives you a good chance to acclimate yourself to the play mechanics. In the amateur level, the 64 plays an intermediate game. Pro level pulls out all the stops and the play action is fast and furious; the computer plays its best game at this level.

The color, graphics, and play-action are all superb, but the animation is the best. The movements of the players are so lifelike that it's hard to believe that you're watching bits of binary code lobbing and serving. The sound effects are *par excellence*, and Imagic has paid great attention to detail. They've even included a ball jockey to run out onto the courts and pick up any netted balls.

The joystick controls the movements of the players, while the fire button activates the racquet and player's swing. The swing is determined by the motion of the joystick: up or down calls a fast serve, while the central position issues a normal serve. The player's position, coupled with the type of serve, determines the bounce spot on the opponent's court. You'll be surprised at how good a player you can be by practicing a bit.



During play, the computer keeps tally of the score automatically, so you can concentrate on the game itself. You're given the opportunity to enter your name as well as that of the opponent (human or computer) at the beginning of the match. At the end of the match, the level and number of players is displayed. (This gives you a good chance to applaud or groan).

What especially makes *Tournament Tennis* so good is its attention to detail. The game has virtually all of the elements of real court-side action: serves, forehand and backhand shots, lobs, volleys, balls in or out, defensive or offensive play, tie-breakers—everything but sweat and the roar of the crowd.

The on-screen surrogate players are color coded: Player one is dressed in a cyan top, while player two is outfitted in dark blue. I found this to be a great aid in keeping track of where "I" was, since the players change court sides during the match.

I found head-to-head competition against another live player to be the most satisfying, since the computer is so consistently good. In such "live" games, the play action becomes furious after both players have gotten the hang of the control mechanics, and I can envision a day in the near future when we'll be having an electronic Wimbledon at my home.

If you're into tennis and really appreciate a great computer sports simulation, get a copy of *Tournament Tennis* from Imagic—excuse the pun, but you'll love it.

REVIEWED BY ARNIE KATZ

Breakdance

Computer: Commodore 64
Publisher: Epyx
1043 Kiel Court
Sunnyvale, CA 94089
Medium: Disk
Retail Price: Not available

Is there hope for the clumsy, slow, and un-athletic in a world dominated by Michael Jackson? Designer Stephen Beck now provides a way, through his latest release *Breakdance*, for you to take a spin at breakdancing without risking life and limb.

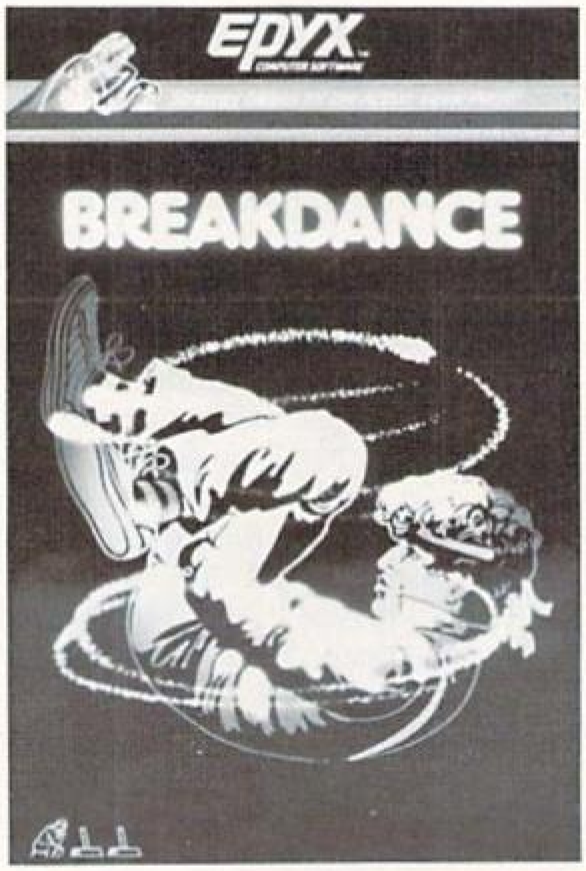
Breakdance is composed of three action-strategy contests and an entertainment program. The trio of games can be played singly or in a rotation called the "Grand Loop." The entertainment section makes it possible to choreograph a dance routine containing over 250 individual "steps" and view an animated playback.

In the first game, the player has just moved into town and must demonstrate his best breakdance moves to the king of the local bad boys, Hot Feet. Before the competition, the gamer can practice the five basic breakdancing moves: bop left (push the joystick left), bop right (push the stick right), point (push the joystick forward), squat (pull the stick back) and spin (hit the action button).

When the practice session is finished, the F1 key brings the blue-suited Hot Feet into action. He executes one of five moves and challenges the upstart to duplicate it. If the move is copied successfully, Hot Feet repeats it and adds another step. This "Simon Says" continues until the player misses. Four misses ends the game.

The second event pits the player's fragile breakdancing reputation against the Rocket Crew. Rows of dancers bop down the street directly toward the pier in the foreground. The human-directed breaker must duplicate the sequence of steps before the Rocket Crew's front line pushes him into the drink.

Take a spin at breakdancing without risking life and limb.



When the first wave struts down the street, the player moves the joystick left or right to position the on-screen dancer directly in front of one of the Rocket Crew members. Using the same input system as in the Hot Feet scenario, the gamer tries to copy the routine. At first, there are only two dancers in a line, then three, and finally four. All the dancers in each of the early rows perform the same routine, but each breaker in the later lines has his own set of steps.

The player earns one point for each Rocket Crew dancer eliminated. The game ends when the player defeats the whole Crew, or when the dancing army pushes our hero into the water four times.

Boogaloo Brewster, king of the breakdancers, is the opponent in the Perfection Dance Puzzle, the third contest. The program generates a four-, six-, or eight-step routine which Brewster performs in the schoolyard at the bottom of the screen. The gamer must analyze this routine and determine the correct order of the poses shown on the selection screen. A "boom box" radio appears in the schoolhouse window which corresponds to each properly identified step. The gamer must completely solve the routine through such repeated trials before the flag descends the pole on the right edge of the playfield.

The Perfection Dance Puzzle ends when the flag has fallen to the bottom of the pole four times. Until that happens, the player gains a point for every properly selected pose and loses a point for every mistake.

A stellar attraction is the construct-a-breakdance kit. When the disk loads, the screen shows the stage of the citywide Breakdance Festival. The menu replaces the dance screen when the joystick is pushed to the left or right while the action button is depressed. Hit RETURN or select "Go Dance" on the menu screen to return to the stage for a performance.

The choreographer enters a breakdance step by moving the joystick forward or backward to highlight the desired step and then hitting the action button. The number of the move appears in the workspace located on the lower half of the display. An animated drawing of a dancer performs the step as an added visual check. It is easy to change a previously entered step with the joystick. To store a dance for later replay, select "Save" on the menu screen. Up to 16 routines can be kept right on the program disk.

Once you've completed your creation, it's time to return to the stage for the show. Five songs, lettered "A" to "E," can be selected with the keyboard. The joystick can change the speed of the dancer's movements to coincide with the music or move the performer around the stage.

The animation and music are both exceptional. The only flaw in the graphics is that it isn't always easy to tell whether the on-screen breaker is in the "bop left" or "bop right" pose. This problem disappears of its own accord once you become reasonably familiar with *Breakdance*.

None of this program's four major sections, with the possible exception of the create-a-dance option, could carry a whole disk by itself. Put them all together, however, and you've got an excellent title. So put on those dancin' shoes and start breaking! C

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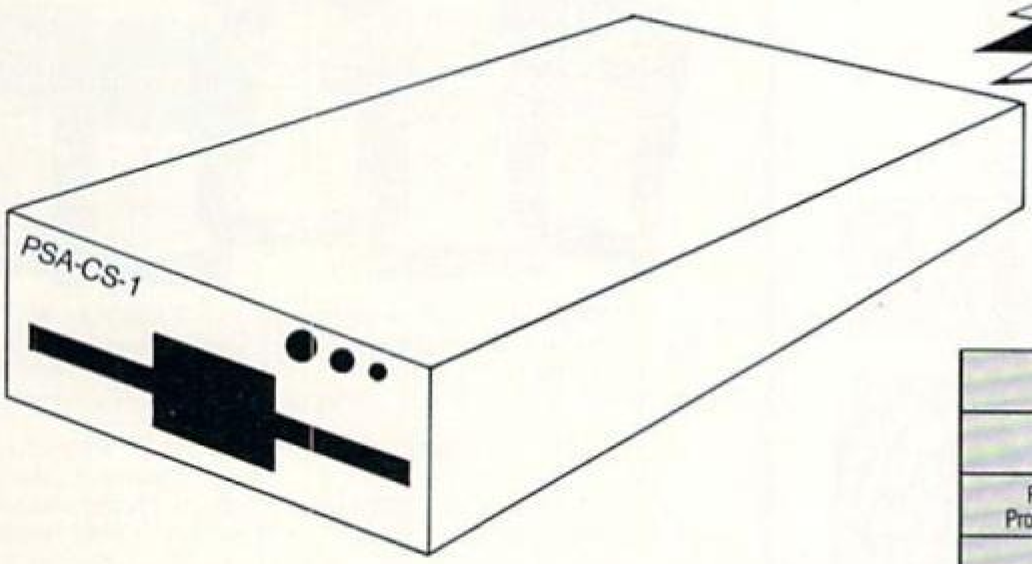

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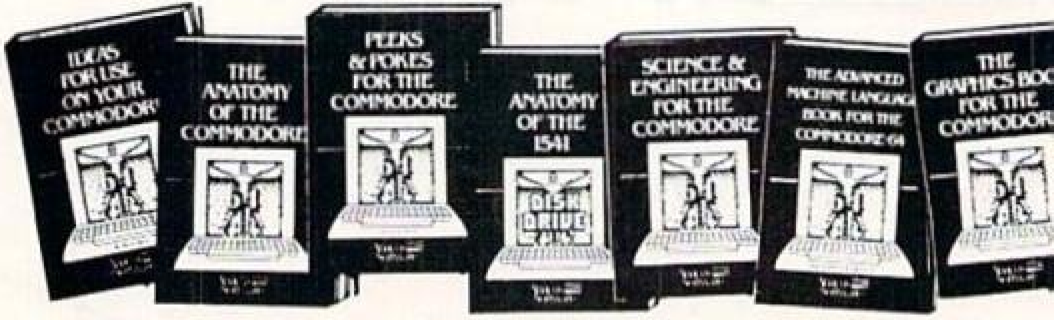
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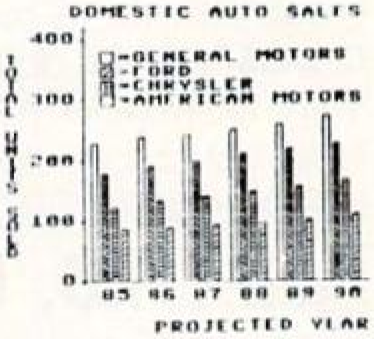

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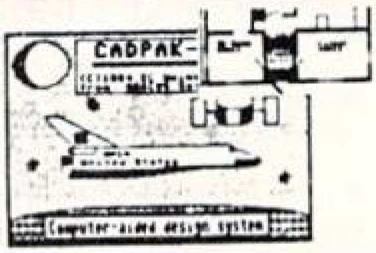

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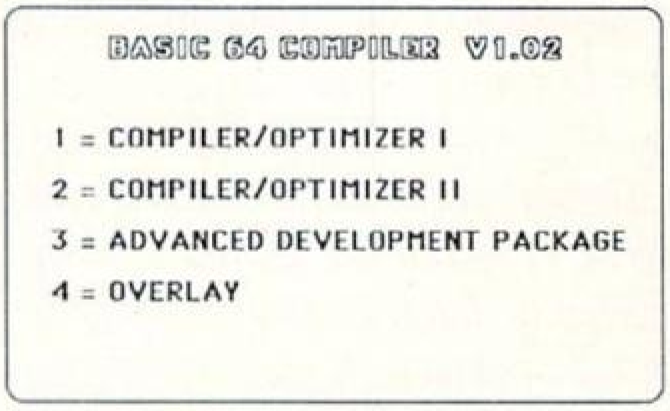

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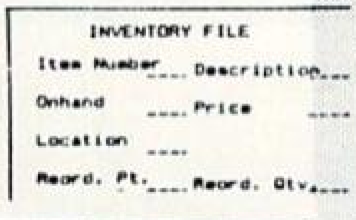

```
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Location   ____
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```

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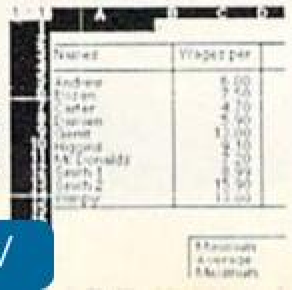

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Power Play 8/85

BY LOUIS F. SANDER

All About the MPS-801 and VIC 1525 Printers

Computer Wizard regularly presents elementary topics of interest to Commodore computerists. It emphasizes the needs of beginners, but is of use to advanced computerists as well. The column is written to be easily understood by all, and to be of lasting value to its readers. If you have comments or suggestions for Computer Wizard, please write to Louis F. Sander, in care of this magazine.

Their low cost, attractive appearance, and total Commodore compatibility make the MPS-801 and VIC 1525 two of the world's most popular printers. But many of their owners, relative newcomers to computing, remain in the dark about their capabilities. This article explains those capabilities to help you gain a good understanding of every MPS-801 and VIC 1525 feature.

The two printers, though somewhat different in external construction, are virtually identical in operation. Because the MPS-801 is the newer model, we will use that designation in our explanations. We'll assume that you know how to install the ribbon, how to insert and advance the paper, and how to make the printing pressure adjustment. If you don't know these things already, you should consult your instruction manual. By the way, the first step in understanding your printer, or any piece of hardware, is to familiarize yourself with its manual. Don't be surprised if it's foggy the first time through—computer material takes several readings to comprehend. Our material here in addition to explaining your printer, will help you understand its manual.

Many readers are already familiar with the BASIC file commands OPEN, PRINT#, CMD, and CLOSE, so we've covered these in a separate section. If those statements are still mysterious to you, you should read that section right now.

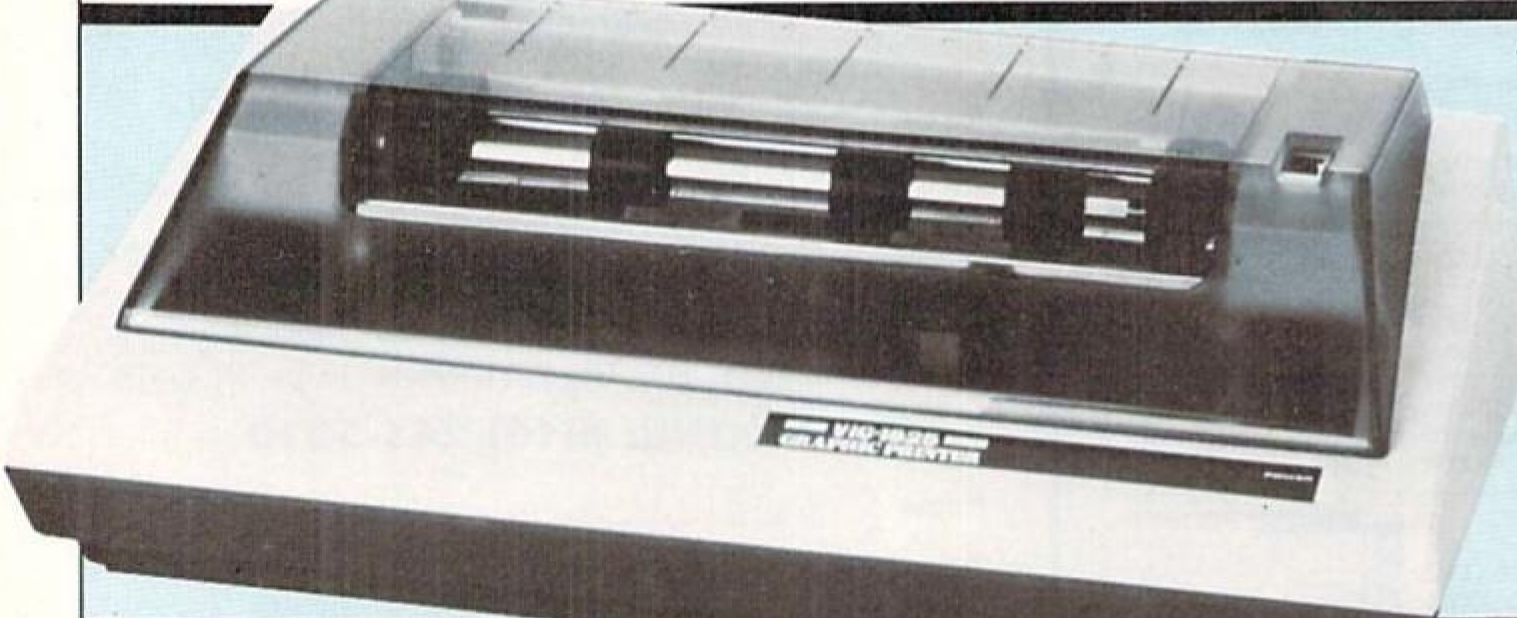
Physical Features

Your MPS-801 connects to the computer through a cable plugged into one of the printer's two back-panel serial-bus connectors. Most serial-bus devices have two of these connectors, allowing you to chain a group of devices to the computer. The first cable runs from the computer's serial-bus connector to one connector on a peripheral. The second cable runs from that peripheral's second connector to a connector on another peripheral. The third cable runs onward from that peripheral's second connector, and so on to the end. A few devices, for example the 1520 plotter, have only one serial-bus connector, so they must be placed last in the chain.

Occasionally, commercial software refuses to work if more than one device is connected to the bus. For that reason, many people make their disk drive the first device in the chain, allowing easy disconnection of the rest of the chain when needed. But for most purposes, it doesn't matter which device is at what position in the chain.

Your MPS-801 has a back-panel switch to put it into a self-test mode, or to select its device number as either four or five. In the self-test mode, the printer continuously prints an 80-column test pattern. You can use the test pattern to align your paper horizontally. Just move the tractor mechanisms from side to side until the printed material is exactly centered between them. Between the tractors, and behind the paper, is a movable support wheel that you should keep centered on your paper. And speaking of paper, you should never run your printer without it. Doing so could damage your print head.

The device-number switch can be useful or not, depending on the size of your system. In one-printer systems,



The first step in understanding your printer, or any piece of hardware, is to familiarize yourself with its manual.

device number four is generally used for the printer. When there are two printers, say a dot matrix and a daisy wheel, it's common to number one of them four and the other one five. With the switch, you can set things up as you like.

The MPS-801 has a self-inking ribbon, with an internal reservoir of ink. When your print is very light, you can usually darken it by setting device number four and running this program:

```
10 OPEN 4,4
20 PRINT# 4,SPC(75) : GOTO 20
```

It will self-ink your ribbon by continually cycling the carriage. After a minute or so, stop the cycling by pressing STOP and RESTORE, then enter CLOSE 4. Unless your ribbon is very old, your print should be much improved. Brand-new ribbons often need this treatment, since they dry out easily in storage.

Character Sets

Just like your computer, your MPS-801 has two different character sets. Later, we'll describe how to switch between them, but for now let's look at the characters themselves, as illustrated on two pages in Appendix C of your manual. (Don't overlook the second page.) Observe that every member of your computer's character set has a corresponding member in the MPS-801 set. But the characters are somewhat different, since the computer uses an eight-by-eight dot matrix, while the printer uses six-by-seven. Also notice that the characters on the left half of each chart correspond to unshifted characters, while those on the right half are shifted.

The MPS-801 and 1525 have two character sets: uppercase/graphics and uppercase/lowercase.

The manual shows the characters in a hexadecimal table format, which often confuses beginners. To see them in the more familiar CHR$ form, run the following program:

```
10 REM ** CHARACTER SET
   DEMO **
20 OPEN 4,4
30 FOR J=32 TO 127 : GOSUB 70:
   NEXT
40 FOR J=160 TO 255 : GOSUB 70
   : NEXT
50 CLOSE 4
60 END
70 PRINT#4,"CHR$("; J; ") ";
   CHR$(J); CHR$(17); CHR$(32);
   CHR$(J)
80 RETURN
```

Note that there are no printed characters for CHR$(0) through CHR$(31) ($00-$1F hex) or CHR$(128) through CHR$(159) ($80-9F hex). Instead, some of those values are *control characters*, or *control codes*, used to control various MPS-801 features. Here is a complete listing of MPS-801 control codes, all of which will be explained later:

Code	Computer Meaning	Printer Meaning
CHR$(8)	N/A	Enter bit-image mode
CHR$(10)	N/A	Line feed
CHR$(13)	RETURN	Carriage return
CHR$(14)	N/A	Enter double-width character mode
CHR$(15)	N/A	Enter single-width character mode
CHR$(16)	N/A	Set carriage position
CHR$(17)	Crsr down	Enter lowercase/uppercase mode
CHR$(18)	RVS	Print reverse-field characters
CHR$(26)	N/A	Repeat selected bit image
CHR$(27)	N/A	Specify dot address
CHR$(145)	Crsr up	Enter uppercase/graphics mode
CHR$(146)	RVS off	Cancel reverse-field characters

commodore
MPS 801

Just like your computer, your MPS-801 has a so-called "quote mode." After one quotation mark, CHR$(34), has been printed, control codes will be printed as reverse-field characters. As with the computer, either a carriage return or a second quotation mark takes the printer out of quote mode. (Sharp-eyed readers may have noticed quote mode's effect on the CHR$(34) line in the output of our Character Set Demo program.)

Look closely at the two printed character sets, which are often called the "cursor-up" and "cursor-down" sets, for reasons that will become obvious. The cursor-up set features uppercase letters when unshifted, and graphic characters when shifted, just like the default character set on your computer. The cursor-down set has lowercase letters, with uppercase letters when shifted, just like your computer's alternate character set. Notice the mnemonic value of the terms "cursor up" and "cursor down"—they imply the sort of characters printed by unshifted codes in each set.

Your printer will produce either of these character sets, depending on the secondary address used in its OPEN statement. When the printer file is opened with SA=0, (or with no secondary address), the default character set is the cursor-up set (uppercase/graphics). When it is opened with SA=7, its default character set is the cursor-down set (lowercase/upper case).

It is possible to temporarily move out of the default character set by sending a CHR$(145) (cursor up) or CHR$(17) (cursor down) character to the printer. Either of these characters puts the printer into the corresponding character set. We say "temporarily," because the printer returns to its default character set as soon as its carriage returns to the left margin.

Looking at some other control characters, you'll see that your printer can also print reverse-field characters, controlled by CHR$(18), or RVS, and by CHR$(146), or RVS OFF. As with screen printing, a carriage return disables the reverse-field setting.

Also as in your computer, CHR$(13) produces a carriage return. An additional control character, CHR$(10) is called "linefeed" in the manual, but appears to perform the same function as the carriage return character.

Printing Modes

The MPS-801 has three unique print modes, separate and distinct from its character sets. They are:

- Standard-character mode, enabled by CHR$(15)
- Double-width character mode, enabled by CHR$(14)
- Bit-image mode, enabled by CHR$(8)

Standard-character mode gives 80 characters per line, and is the active mode when the printer is first turned on. Double-width character mode gives 40 characters per line.

> *The 80-character print line is made up of 480 dots (80 characters per line by six dots per character).*

Bit-image mode is used for special effects and high-resolution graphics. In this mode, each character code prints, instead of a character, a vertical image of the seven low-order bits of the code. A sub-mode, activated by CHR$(26), can be used to repeat this image as many times as desired, making it easy to plot horizontal bar graphs. The bit-image mode and its repetition sub-mode are amply illustrated in the instruction manual. If you study the book's examples, you'll be able to understand these modes.

When the printer is placed in any of the three modes, it stays there until another mode is set. Carriage returns do NOT return it to the default (standard-character) mode. A system reset, of course, will put it into the default mode.

Line spacing on the MPS-801 is six lines per inch in the bit-image mode. The six lpi setting gives standard typewriter spacing for text output, with 66 lines per 11-inch sheet of paper. The nine lpi setting causes printed lines to touch each other, with no spacing in between, which makes good sense in printing high-resolution graphic screens.

When printing Commodore's keyboard graphics, or when tight line spacing is desired, the six lpi setting puts unwanted space between the rows of characters. In these cases, you can invoke the nine lpi setting by a simple programming trick. Just end each printed line with a CHR$(8), and begin the next with a CHR$(15). When the carriage return occurs, the printer will be in bit-image mode, and will space at nine per inch. Immediately thereafter, it will return to single-character mode, allowing it to print the characters you desire. Ingenious, eh?

Positioning the Carriage

On the MPS-801, the printed line of characters has 80 positions, numbered from 0-79. By using the CHR$(16) control code, we can position our printhead to any one of those positions.

Sending the printer a CHR$(16)"nn", where n is a digit from zero to nine, moves the carriage to position nn. Either of these lines will print the word "HELLO," starting at print position 25:

```
PRINT#4,CHR$(16)"25";"HELLO"
PRINT#4,CHR$(16)"25HELLO"
```

This will print it at position 7:

```
PRINT#4,CHR$(16)"07HELLO"
```

Such carriage positioning commands always refer to the 80-wide print line, even if double-width printing is in effect. They cannot be used to "tab backwards," that is, to return the printhead to a previous position on the print line. They *can* be used several times on a line, and they always position the carriage relative to position zero, not to the present carriage position. For example, the following line will print HELLO at the start of the line, THERE at position 33, and HARRY at position 50.

```
PRINT#4,"HELLO"; CHR$(16);
"33THERE"; CHR$(16); "50HARRY"
```

The 80-character print line is made up of 480 printed dots (80 characters by six dots per character). Using a variation on the above theme, we can place the carriage at any *dot* position on the line. The dots are numbered 0-479, and to use dot positioning we use a CHR$(27) before the CHR$(16). The two characters after the CHR$(16) specify the dot position, but in a mathematically different way: bytewise, in high byte-low byte sequence. To specify dot position 20, these characters are CHR$(0) and CHR$(20). To specify dot position 255, they are CHR$(0) and CHR$(255). And to specify position 256, they are CHR$(1) and CHR$(0). The last dot position, number 479, is specified by CHR$(1) and CHR$(224). From the examples, you can see that the first character specifies the number of 256's in the position, while the second specifies the number of ones. If you don't understand the principle, you should study it until you do, because it's a common one in computer math.

When the carriage is positioned this way, we need not be in bit-image mode. It's perfectly legal to print single- or double-width characters at any of the 480 dot positions. To emphasize the point, here's the command to print our greeting at position 259:

```
PRINT#4,CHR$(27); CHR$(16);
CHR$(1); CHR$(3); "HELLO"
```

One final point on carriage positioning is that the TAB(X) command does not work quite as you would expect with the MPS-801. Rather, it works like SPC(X): Instead of tabbing to print position X, the printer will skip X spaces, which is, of course, a different thing. Similarly, when a comma is used to separate printed items, the printer skips ten spaces between them, instead of printing the second item at the next ten-space tab stop. You should be aware of these matters if your program uses TAB's or commas for positioning.

Well, readers, if you've followed us this far, you ought to be printer experts. You've covered the MPS-801's (and the VIC 1525's) physical features, character sets, and printing modes, and you've learned to print anywhere on its print line. If you don't know *all* about your printer, you're as close to it as most of us ever get, and we hope you've found it worthwhile.

Because you're now an expert, we'll show you something special—you can have several files open to the same printer at one time, each with its own characteristics! Run this program to see what we mean:

```
10 OPEN 2,4
20 OPEN 3,4,7
30 OPEN 128,4
40 PRINT#2,"SURPRISE!"
50 PRINT#3,"SURPRISE!"
60 PRINT#128,"SURPRISE"
70 PRINT#2,"LOOK AT THE
      CHARACTER SETS AND LINE
      SPACING!"
80 CLOSE2 : CLOSE3 : CLOSE128.
```

If you want to learn more, work the examples in the manual. Like most computer manuals, yours will contain some errors, but doing the examples and finding the errors will make you a better computerist.

BASIC File Commands

In Commodore systems, every peripheral device, from the keyboard to the disk drive to the printer, is treated as a *file*. The idea of a "file" is not particularly easy for beginners to grasp, but with practice and experience it becomes an obvious concept. Its essence is this: To be compatible with the computer, external information must be arranged in some sort of regular and logical way. Any collection of accessible, logically arranged information is called a file.

Commodore BASIC has a group of commands which make it easy to exchange information with files. And every Commodore peripheral is intelligent enough to react appropriately to the file-related commands. The result is that each peripheral looks the same to the computer, minimizing the programmer's work in handling them. To use a Commodore printer, for example, you associate it with a numbered file, then write to the file at will, paying little further attention to the printer's operating requirements.

To communicate with printer files, Commodore BASIC uses the commands OPEN, PRINT#, CMD, and CLOSE, each of which calls for a certain action to be taken on a file, and therefore on the printer. Each file is referred to by a number, called a *logical file number*. OPEN assigns a logical file number, associates that number with a given printer, and prepares the printer to receive data. PRINT# writes data into the file, as do CMD and PRINT, when used correctly together. CLOSE tells the file that we are finished with it.

The OPEN command has the following syntax:

OPEN *lfn,dn,sa*

OPEN can be abbreviated as O shift P. In our example, *lfn* is the logical file number we want to assign to the printer, and it can be any number from 1-255. If the logical file number is 128 or greater, the computer will make the printer double space between lines.

The *dn* and *sa* refer to device number and secondary address, which are properties hard-wired into the printer. In the MPS-801, the device number can be either four or five, depending on the setting of a rear-panel switch. The MPS-801 has two valid secondary addresses, zero and seven, which are explained in the main text. The "sa" is optional in the OPEN command. When it is left off, the secondary address defaults to zero. In OPEN and the other file handling commands, *lfn*, *dn* and *sa* may be expressed as constants, as variables, or even as expressions.

PRINT# works like BASIC's PRINT statement, except it directs the output to the indicated file instead of to the screen. Its syntax is:

PRINT# *lfn,data*

where *data* is whatever you'd like the printer to print. It is illegal to leave a space between the PRINT and the #, though spaces are acceptable anywhere else. It's also illegal to abbreviate PRINT# as ?#. If you make this error, you'll have a big problem, since that form lists as PRINT#, but gives a syntax error when executed. The legal abbreviation for PRINT# is P shift R.

The CMD command changes the output device for PRINT from the screen to the indicated file. Its syntax is:

CMD *lfn*

and the logical file must be OPEN when the CMD is executed. CMD is abbreviated as C shift M. Once a CMD has been executed, anything that would normally print on the screen will instead be sent to the indicated file. To undo a CMD to file X, you must execute a PRINT# X.

Sometimes, when CMD is in effect and an error occurs or the STOP key is pressed, screen printing returns, but with a maddening bug—whenever you press RETURN, the cursor jumps to the end of the line, but refuses to go further. The bug has an easy cure: Press shifted RETURN, then cause a syntax error by typing a few letters followed by a RETURN.

The CLOSE command reverses the effect of the OPEN. Its syntax is:

CLOSE *lfn*

and you use it when you're finished with a file. It is abbreviated as CL shift O; note the three-letter abbreviation. Your computer allows up to ten files to be OPEN at once, to the printer, disk drive, plotter or any number of external devices. Even though ten is a large number in practice, it's good programming practice to CLOSE a file as soon as you're through with it, even though it may need to be reopened later.

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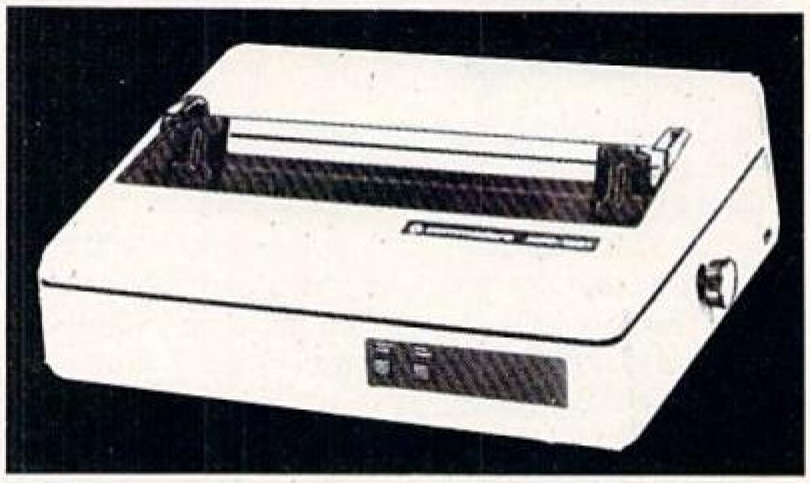

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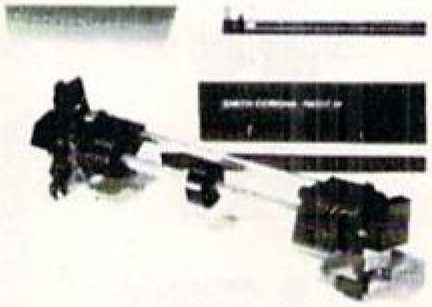

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Print Buffer Size: 132 Bytes (1 line)
No. of Char. in Char. Set: 96 ASCII/ International
Graphics Capability: Standard 60, 72 Dots Per Inch Horizontal, 72 Dots Per Inch Vertical
Pitch: 10, 12, 16.7, 5, 6, 8.3
Printing Method: Impact Dot Matrix
Char. Matrix Size: (Standard) 9H x 8V, (Elongate) 10H x 8V
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Forms Type: Fanfold, Cut Sheet
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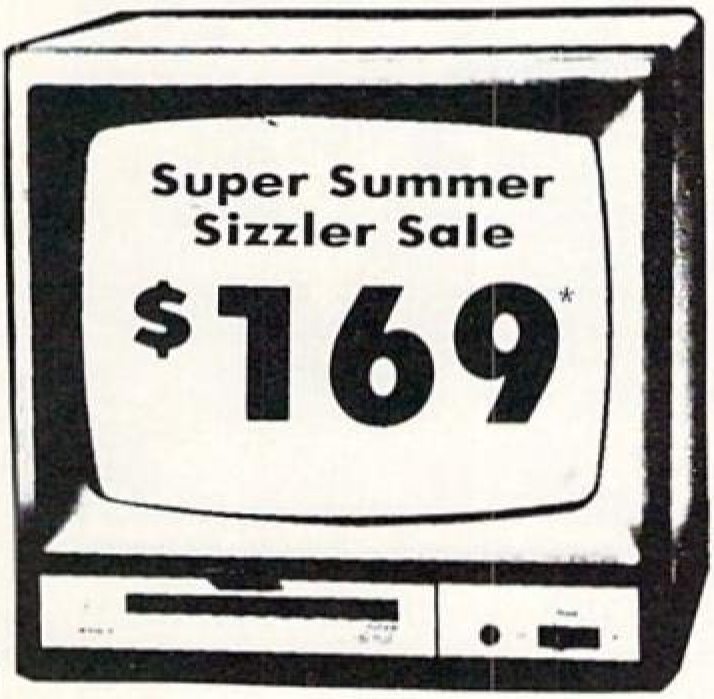
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KIDS' CORNER

BY HOWARD MILLMAN

Have Robot Will Travel

*Let's be honest. You have too much talent to have to earn money hustling hamburgers. But alas, you need the bucks. Here's a solution: Build a robot and send **it** to work instead.*

Seventeen year-old Bradley Reis has turned a love of rummaging around surplus electronic parts shops into a profitable enterprise. A business-oriented hobbyist, Bradley collected a small mountain of motors, batteries, and assorted goodies that only an electrical packrat could love. Then Bradley combined his talents with those of a friend, and, in three months, built a robot.

With their enterprising eyes on starting a publicity business, they distributed flyers to local businesses and caterering halls near their Nanuet, New York, homes. The robot, spontaneously nicknamed "Robbie," was an immediate success. Calls for bookings came for store openings, banquets, and children's parties. And with hourly rental rates averaging $70.00, their animated collection of cast-off components paid for itself in just five months.

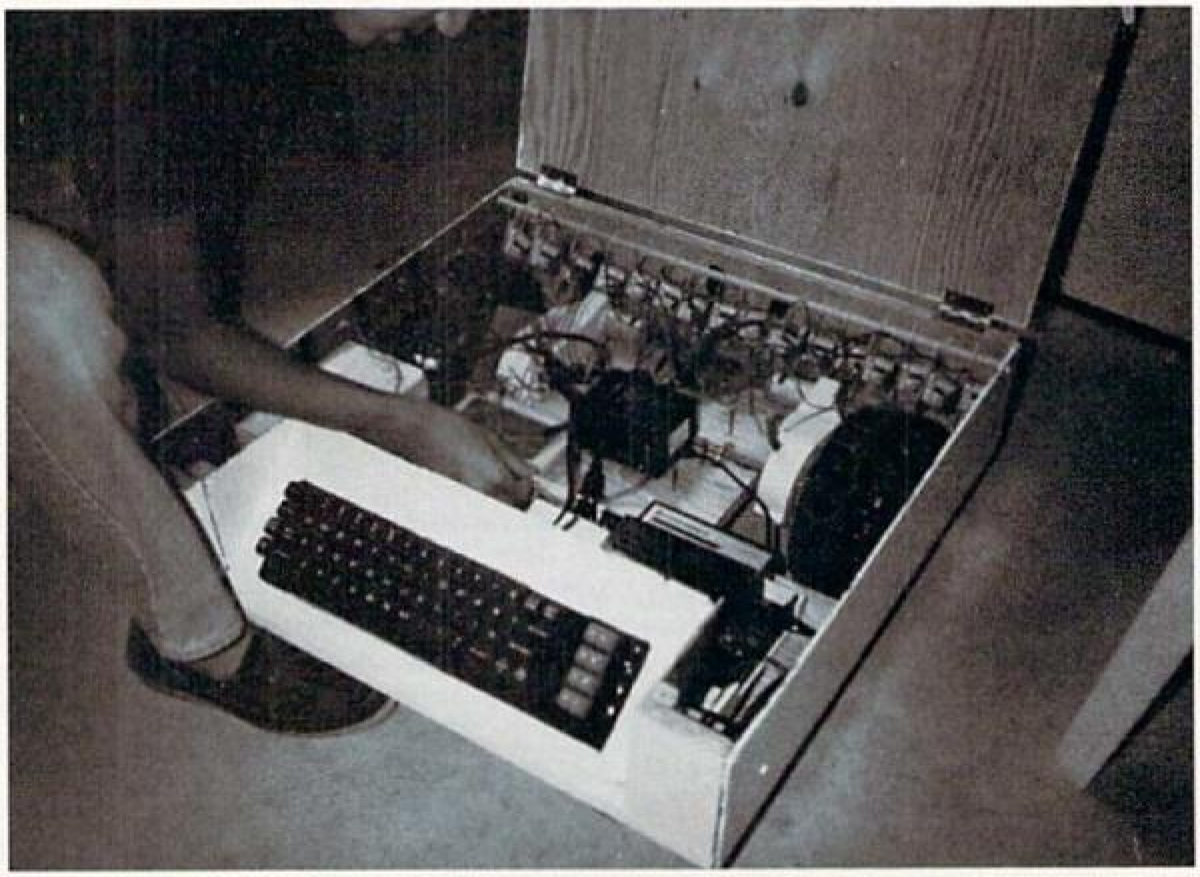
Their first robot's anatomy is functionally rather simple. A square aluminum base houses two six-volt motors with wheels, providing forward/reverse and left/right motion. A gelcell battery provides power. Directions are issued via a Kraft two-channel remote-control transmitter to activate servos that in turn close motor operating relays. An 18-inch diameter plastic cylinder forming the torso rides on the aluminum base. A detachable serving tray is affixed to carry drinks, snacks, or small packages. The aluminum flex-tube arms are fixed into position, so they are for show only.

For added appeal, the cylinder is capped by a clear plastic dome under which resides a flashing strobe light and a cassette recorder. With a flair for flash, the boys painted the torso to resemble a cutaway tux, complete with a red boutonniere and tophat. The cassette recorder plays music, mostly rock at parties, or tapes comments directed to, or overheard at, the parties Robbie attends. (A potential for disaster here: The completed tape is usually given to the host at the affair's end.)

An FM wireless microphone provides the robot's "voice." Bradley usually stays within earshot of the robot and listens to comments and questions directed its way. With the microphone literally hidden up his sleeve, he replies to the questions or even initiates conversations—usually with young ladies, naturally. Surprisingly, no one has discovered his innocent ruse yet, perhaps because everyone's attention is usually riveted on the four-foot tall robot with its dazzling display of lights, motion, and music.

Once he was convinced he had tuned Robbie to near perfection, Brad immediately began building another. With his earlier partnership amicably dissolved, this considerably more ambitious project initially threatened to engulf his limited financial and technical resources. But, drawing on the income and experience gained from Robbie, he was able to design a low-cost sibling, dubbed Comrad. Although this second-generation robot, with its black and white plywood exterior and flashing three-inch red spotlights for eyes at times resembles a rolling hangover, it's actually a Commodore VIC 20 on wheels.

Comrad's every action is guided by his on-board computer. With a Microworld Electronix plus a VIC-Rel



I/O interface, an impressive degree of animation is achieved. The head and body independently swivel, both arms rotate at the shoulder, and one has an elbow too. A parallel jaw clamp—fashioned from a gear-operated jar opener—serves as one hand; the other terminates in spring-loaded flex-steel fingers for grasping smaller, lighter objects. An automobile's electric antenna assembly extends and retracts the fingers on command from the VIC.

Separate 12-volt DC motors control each action. Via some clever engineering, only one motor is required for each movement, since reversing the polarity on a permanent magnet motor also reverses its rotation. The polarity changes, like all current-carrying functions, are handled by the 16 separate I/O-driven relays.

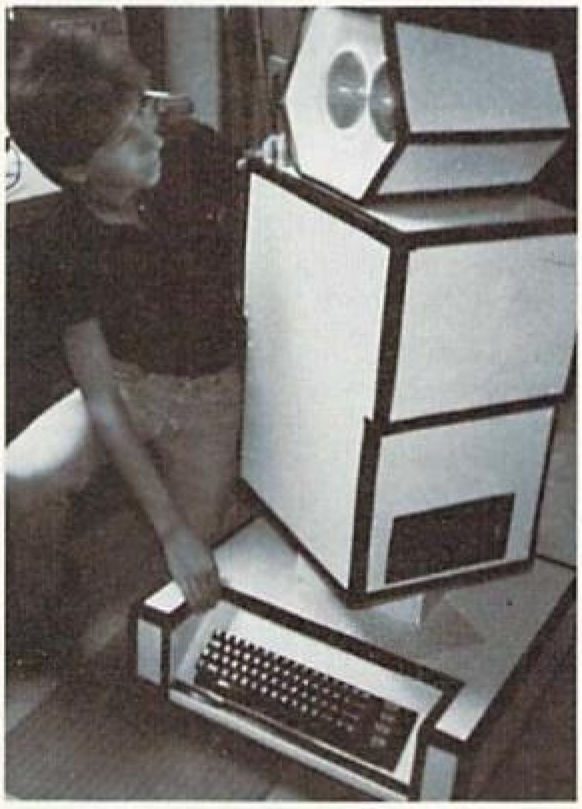
A sonar rangefinder, excised from a Polaroid camera bought at a yard sale, provides feedback for avoiding collisions. That's for the front. The sides and rear are protected by direct contact microswitches. These dometop switches, incidentally, originally designed for use in commercial pinball machines, were scrounged up in a surplus shop at three for a dollar.

All environment-sensing signals are fed back to the VIC for ingestion and response. The information is first stored in the VIC's RAM. Since that's both limited and volatile, Comrad travels with an on-board 1541 disk drive. As the computer's RAM fills, data is automatically dumped to disk. With this considerably expanded intellect, backed by a custom software program, this robot can sample and survive in some seemingly hostile environments.

The resident program to store, retrieve, and respond is written in BASIC. Actually, the program isn't so much *written* in BASIC, but more nearly *learned*. Here's why: Comrad wakes up with an I.Q. of zero. Through an all too familiar, perhaps even popular learning process, it learns through mistakes. But, unlike humans, Comrad never repeats a mistake. Once is enough.

By using remote control joysticks, Bradley deliberately guides the robot into gentle collisions. Then he extricates it. This part of the process is similar to the one he used with his earlier unit, but here's the difference: Now all this information is stored in the VIC or on disk. So when school's over, Comrad remembers and responds defensively when detecting an obstacle, and displays a learned reaction to a common circumstance. This same trial-and-error process guides the motion of its arms, torso, head and even the built-in speech synthesizer. Elementary artificial intelligence at work.

Robbie is controlled with a Kraft two-channel remote-control transmitter. His more sophisticated sibling, Comrad, is guided by an on-board VIC 20.



Bradley, ever the entrepreneur, sees a full future for this robot. After time-consuming—yet necessary—debugging, Comrad debuted at the New York State Science Fair and took fourth place. And speaking of debugging: After all circuits, every connector, and each control have been tested and double checked, Bradley then sits beside his robot, arm around its dome and quietly appeals to the unseen human side of his creation. He implores it to please, please not misbehave in public.

At these moments, the bond between man and machine, creator and created, blurs. This young man feels a justifiable pride in his robots. They are, says Bradley, "More than machines. They're my friends, my comrades." ■

Where to Find Parts

In addition to frequenting neighborhood yard sales and regularly scouring area surplus shops for parts and supplies, here's a list of discount mail order houses. Write or call for their catalogs.

Jerryco, Inc.
601 Linden Place
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Surplus Center
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Santee, CA 92701
(619) 449-2222

H&R Corp.
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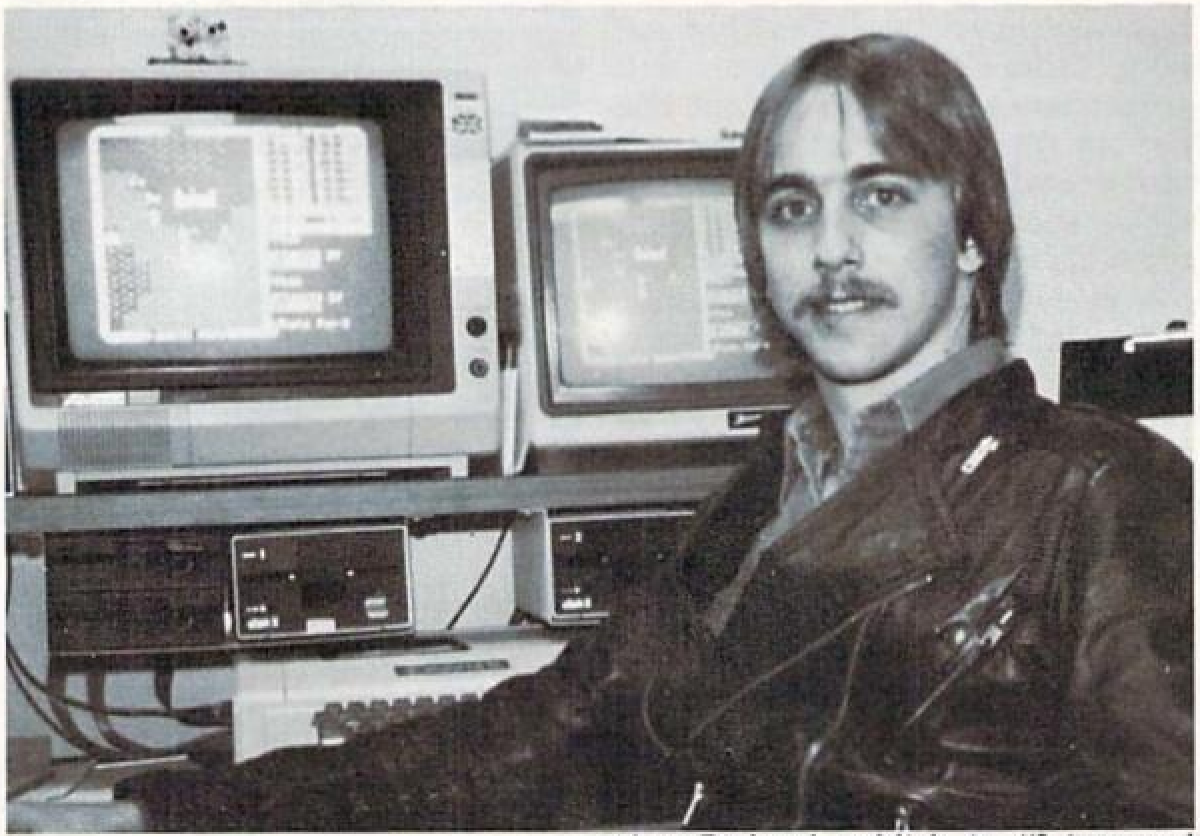
BEHIND THE PROGRAMS

BY PAM HOROWITZ

'Lord British' is from California

Ultima's Creator is Neither a Lord nor British



Lord British, creator of the best-selling *Ultima* adventure series, looks more like a punk rocker than a member of British nobility. The handsome 23 year-old software designer has hair the color of California sunshine, part of which is braided into a new wave "tail". He dresses in jeans, leather jackets and studded belts—hardly the attire of a British lord.

Lord British was born Richard Garriott in Cambridge, England. His family had left their home in California so that Richard's father could take a temporary teaching position at Oxford University. Richard doesn't remember much about merry old England because he was only two months old when his family returned to the United States.

Richard's pseudonym, "Lord British," has absolutely nothing to do with the fact that he was born in England. The title started out as a joke, created by two of his college buddies. When Richard was a sophomore in high school, he took a computer course at the University of Oklahoma. Arriving on campus for the first time, he greeted his roommates with a simple "Hello." "Hello?" they mimicked. "No one here says 'hello.' You must be from England, so we'll call you 'British.'" The name stuck and Richard later embellished it with the "Lord" title.

For as long as he can remember, Richard has been a fantasy game addict. "I was one of the first Dungeons and Dragons freaks," he confesses. His interest in computers, however, didn't start until he was in high school. After his summer of computing at Oklahoma, Richard returned to school in California and decided to combine his computer skills and his fascination with fantasy. Using the school's computers, he began to design and program original adventure games.

Lord British is really 23 year-old Californian Richard Garriott.

Richard's high school was located just outside the Stanford University campus, and the student body was made up of kids whose parents were on the faculty of Stanford. The professors wanted a high-tech education for their children, so the school had three mainframe computers with terminal hook-ups in most of the classrooms. Because Richard had completed the course at the University of Oklahoma, he was allowed to design his own computer curriculum. All he had to do was work on a project of his choice and submit it at the end of the year.

During his three years of self-instruction, Richard created 28 fantasy role-playing games. He kept revising them, trying to make each one better than the last. *Akalabeth: World of Doom* was the name given to the final version and the one which launched Richard's professional computer career.

After he finished high school, Richard got a job at a local computer store. The owner of the store thought *Akalabeth* had potential and suggested that Richard publish it. "I invested $200 of my own money. At that time, it seemed like a small fortune," Richard remembers. Months later, *Akalabeth* was bought and published by a company called California Pacific.

"Publishing *Akalabeth* gave me my first taste of earning money at something I enjoyed," Richard explains. "I was going to college at the time, and it seemed that as my income went up, my grades went down." It was then that Richard decided his days as a student were over; he wanted to spend all of his time designing and programming adventure games.

Since the Garriotts have always been a family of achievers, his decision to quit school didn't win Richard any points with his parents. His father, Owen Garriott, is an astronaut whose first space flight was a two-month mission aboard Skylab II. He was also part of the crew of the STS-9 (the first flight of the Space Lab).

Richard's mother, Helen, is an artist who has done some of the artwork for Origin Systems. One of his brothers is a doctor and another brother, Robert, has several college degrees, including an engineering degree from Stanford and a master's in business from M.I.T. Robert is now president of Origin Systems; he handles the business side of the company, so Richard is free to put all of his energies into creating adventure games.

After *Akalabeth*, Richard designed the first game in the *Ultima* series. It

PREVIEWED BY
TRACIE FORMAN-HINES

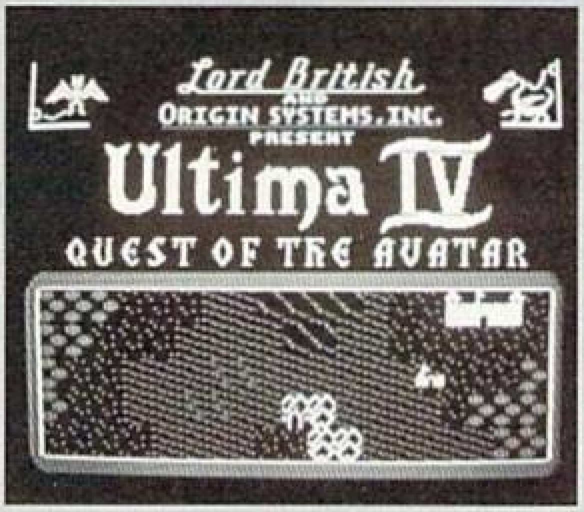
Ultima IV: Quest of the Avatar

Computer: Commodore 64
Publisher: Origin Systems
1545 Osgood Street
North Andover, MA
01845
Medium: Disk

I was a bit nervous as I climbed the stairway that led to Lord British's work chamber. The benevolent monarch of Sosaria and Origin Systems' star game designer had consented to a private audience and preview of *Ultima IV: Quest of the Avatar*. The Lord was quite excited about his latest project, though he was still putting on the final touches as of this meeting.

The game comes packaged with a full-color cloth map of the realm, which is far larger than any previous *Ultima* continent. Origin Systems also plans to include a small ankh pendant as a souvenir and badge of honor.

Ultima IV's plot takes an innovative turn away from the standard role-playing game character generators. Unlike the earlier *Ultimas*, in which the player chose a character race, class, and gender, then allotted points for various abilities, *Ultima IV*'s story starts in a more mundane way: at a county fair where you meet a mysterious tarot card reader. Putting two cards at a time on a table and telling a short story about them, she emphasizes the conflicting values (truth versus justice, for example). Soon only the crucial card remains.



From this card, you will find yourself alone in a strange and fantastic world, filled with mythical beasts and magical objects. Welcome back to the worlds of *Ultima*! As in previous *Ultima* games, this is a menu-driven adventure. Instead of typing in the action you want to take, you just select from the menu of appropriate actions and press the key (like A for Attack). Although learning what each key stands for may be cumbersome to newcomers, many people prefer knowing exactly what can and can't be done. Besides, most adventurers will have memorized the command scheme after the first play session.

Using four keyboard buttons, you move across the countryside, teeming with friends and foes. You start out with little food, equipment or ready cash, so you must find village shops in order to stock up. Towns are populated with a colorful variety of residents, some of whom might have helpful information. So talk to everyone you pass and write down what you hear.

Fans of the first three *Ultima* installments can look forward to some new bells and whistles dressing up the familiar *Ultima* game style. The graphics have been perked up, with double the animation (four frames versus two) plus a new, more detailed appearance to the vast terrain.

A brand new crew of monsters joins all your old favorite nasties, including the dangerous Mimics (they look just like a treasure chest—until you try to open them), Floating Eyes (each eyestalk has a different deadly power) and the food-stealing, previously invisible Gremlins. In addition, monsters don't only travel with their own kind anymore, but attack in mixed groups.

Unlike previous *Ultima* games, once you've entered into battle, it's possible to turn tail and run. This is a useful, and necessary, defense against some of the better organized monster groups, but remember—the monsters can retreat also.

As you become more knowledgeable and experienced, your strengths rise accordingly. Although only one character begins the game, it's possible to attract followers in the towns and villages as you pass through. A good hint: A smart hero is nice to everybody and avoids dueling with potential friends. A good one to watch for is the wandering bard Iolo, who might have helpful information—if you can track him down.

This game has many quests-within-a-quest and the castle holds many secrets for the resourceful player. And, of course, there are the dangerous dungeons to survive.

Although Lord British requested that I don't give away too much of the ending, I can tell you this: Much of the success in the game depends upon your character's actions throughout the adventure, not just his or her prowess with the sword. Don't expect to solve *Ultima IV* in a month or two. But do expect to get more than your money's worth! C

---

was also published by California Pacific and was one of the first fantasy games to make good use of graphics with very little text.

Ultima II, the second in the series, was published by Sierra On-line. It was a larger game than *Ultima I*, with improved graphics and an expanded map. *Ultima II* was very involving and captured the imagination of computer adventure lovers.

Next came *Ultima III*. It was bigger and better than its predecessors and was even more successful. *Ultima III* took more than a year to complete and became the first official product of Richard's own company, Origin Systems. "We wanted more control over the finished product and the packaging," says Richard, "so we decided to form a company and publish the programs ourselves."

Now comes the really big one—the ultimate *Ultima*. Richard can hardly contain his enthusiasm when he talks about the newest member of the Origin family, *Ultima IV*. "It's at least two or three magnitudes better than *Ultima III*, says Richard. "It's more user-friendly than the others. We've put more information on the screen so players don't have to use the fact sheet."

Ultima IV is divided into eight quest groups and each group is almost equal to the size of one *Ultima III*

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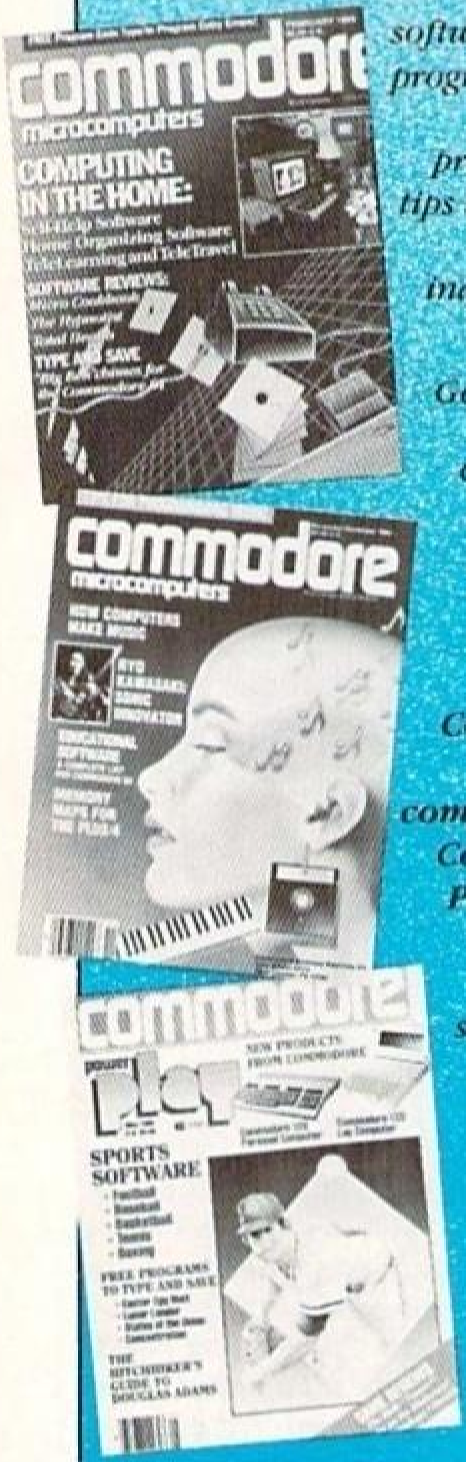

Richard Garriott is Lord British and Lord British is Richard Garriott. It's hard to tell where one leaves off and the other begins.

game. It comes with a map, which contains 16 times more data than the map in *Ultima III*. Richard estimates that it will probably take two or three months of afternoon and evening play to solve the mystery.

"After *Ultima III* became a hit, I began to get lots of fan mail. It was then that I realized I was actually making an impact on the people who played my games, and I decided I wanted that impact to be positive." Richard's new philosophy will become very apparent to the players as they get deeper into the game.

Richard's ideas for his fantasy games are a combination of everyday situations and lots of imagination. "Each of the *Ultima*'s just happened," continues Richard. "They're very spontaneous. I drive my girlfriend crazy asking for a slip of paper every time another idea hits me!"

When asked how many *Ultima*'s were in his future, Richard is undecided. "I learn more each time I write one," he replies. "I'm still in the 'scrap it all and start over' phase." Richard explains that he won't be satisfied until he learns how to cram as much as possible into a system and is totally pleased with the internal data structure.

In addition to the *Ultima* series, Origin Systems is launching some other dynamite games unlike any you've ever played before. *Auto Duel* is an action-packed strategy game where you build your own battle car, choosing the chassis, tires, armor plate, body style and weapons from an assembly line. Once your mean machine hits the road, you go to the American Auto Duelists Association to receive your mission. The game involves many factors including role playing, adventure and arcade action.

Moebius is a martial arts game with amazing graphics. A professional kung-fu expert and a Japanese sword fighter were photodigitized to show people in realistic combat positions. The images become views from the side and above, and they take up almost half of the screen.

Lord British and the *Ultima* series are a proven success, and the new offerings from Origin Systems appear to be destined for the same. For Richard Garriott, the timing was right. He became involved in computers when the industry was just beginning. Unfortunately, it's not so easy for would-be programmers to strike it rich in today's computer market. Richard has a few words of wisdom for anyone who's hoping to follow in his footsteps.

"It's very important," says Richard, "to carefully and intentionally develop the expertise necessary to be a good programmer. Get as much hands-on experience as you possibly can.

"Find a project that you will really enjoy working on and make sure the idea is unique. To be successful, games must be visually dynamic, state-of-the-art, and very user-friendly.

"If you're really serious, get going with a working prototype. Nobody buys ideas; they want to see sample screens showing graphics and how the game is going to work."

Richard believes that the Pacman days are gone for good. The market has been saturated with arcade-type action games. To be a hit in today's game world, a program has to be an all-in-one combo of action, animation, graphics and fantasy.

Everyday at exactly five o'clock in the offices of Origin Systems, fantasy turns into reality. Richard and the rest of the staff put on helmets, load their guns and turn the office into a battlefield. "Rubbaser war" is officially declared! Rubber-band bullets fly through the air at a startling speed of 120 mph, powered by sleek rubbaser guns. The graphite and steel weapons are ordered from a specialty store in New York and cost $75 each. Richard owns four of them!

Richard Garriott is Lord British and Lord British is Richard Garriott. It's hard to tell where one leaves off and the other begins. Perhaps that is the secret of his success. Like an artist with a paintbrush, Richard is an artist of fantasy who uses a computer to express his creativity. C

BY THOMAS F. TROCCO

A Secret Code Subroutine for the Commodore 64

Add this subroutine to programs that you want to keep secret.

Occasionally, we need to protect programs so that they cannot be copied or listed. A few hints have appeared in various magazines, and I now have one to add.

If you have a program (or message) that you want only certain people to use, you can share a secret code word with them. Without this word, the program will NEW itself, and not allow the unauthorized person access.

First, you should choose a secret code word. I'll be using MONKEY (because I am a primatologist who studies monkeys in the jungles of Peru). Don't use your name, or the word secret, because these are too easy for people to guess.

Second, load in a program, or type in the short test program below. We will be NEWing this program (erasing it from the computer's memory) on purpose, so make sure you save a copy of it.

Third, type in our secret code subroutine below. Remember, to enter line 4 you must use the question mark instead of the PRINT command or it won't fit in one line.

Program Explanation

Line 0 will not allow the program to be listed.

Line 1 will disable the RUN/STOP and RESTORE keys, so someone can't break the program in the middle and attempt to list it.

Line 2 will clear the screen.

Line 3 asks the user to input the code word.

Line 4 is set up so if the code word is not MONKEY (which is what these CHR$ codes are), then you will get the "YOU LOSE" message, and the program will self-destruct (NEW itself). We are using CHR$ codes to further protect the program. If someone manages to list the program, they still may not be able to find the code if it is written in this way.

If the code word is correct (MONKEY), the program proceeds to the main body of the program.

If you choose a different code word, you must change the CHR$ codes in line 4. You can look these up on pages 135-137 of the Commodore 64 user's guide that came with your computer. If you want to use a secret word longer than MONKEY, you will have to abbreviate the commands as follows:

CHR$ = C<shift H>
POKE = P<shift O>
THEN = T<shift H>

Now, find the line where your program ends. This may be a line with the END command, or it may not. Sometimes, it will be found where a program asks you if you want to "PLAY AGAIN (Y/N)." In our test program, it is line 170. Replace the command END (or add a line) with:

<line number> NEW

For example, in our test program, line 170 will become:

170 NEW

This will NEW the program, so it can't be listed.

Now let's try it! After you have made the additions and changes listed above, save your new program. I'll repeat that: SAVE YOUR PROGRAM NOW. Now run it. When prompted for the secret code word, enter a wrong word. You will now see the "YOU LOSE" message, and if you try to list the program, there will be nothing in the computer's memory.

Now re-load the test program and run it again. This time, enter the correct code word. The program will run, but you won't be able to stop it with the RUN/STOP-RESTORE keys. When the program ends, it will NEW itself and disappear.

When you are finished, you can enter POKE 808,237 in the direct mode to reset the RUN/STOP-RESTORE keys.

My daughter Meredith (age ten) has used this subroutine when sending private computer letters to her friend Jessica.

WARNING!!!!!! Always save any program you will be using with the secret code subroutine before you run it, because it will NEW itself whether you type in the correct code word or not!! (And don't say I didn't warn you.)

Tom Trocco can be heard on WNYC radio (83 AM) in New York as a participant in "Small Things Considered," a show for children that airs Tuesdays and Wednesdays at 5 p.m. ■

Before typing this program, read "How to Enter Programs."

Test Program

```
100 REM MAIN PROGRAM
110 PRINT"THIS IS A TEST PROGRAM"
120 PRINT"NOW TRY TO USE THE"
130 PRINT"RUN/STOP-RESTORE KEYS"
140 FOR T=1 TO 5000:NEXT
    :REM WAITING LOOP
150 PRINT"PRESS ANY KEY TO END"
160 GET A$:IF A$=""THEN 160
170 END                                  (END)
```

Secret Code Subroutine

```
0 REM [SHFT L]
1 POKE 808,225
2 PRINT"[CLEAR]"
3 PRINT"TYPE IN OUR SECRET CODE WORD";
  :INPUT SC$
4 IF SC$<>CHR$(77)+CHR$(79)+CHR$(78)
  +CHR$(75)+CHR$(69)+CHR$(89)THEN
  PRINT"YOU LOSE":NEW                    (END)
```

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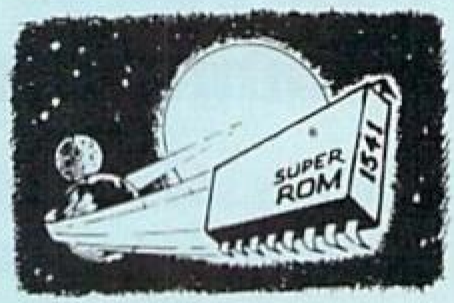

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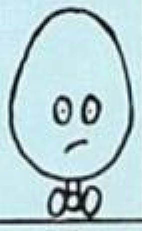

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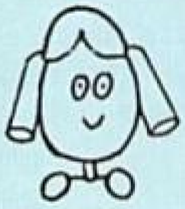

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BY ERIC GIGUERE

Simple List

for the VIC 20 and Commodore 64

List each statement of your programs separately, to make them easier to read and correct.

Have you ever, by any chance, wished for a way to make your program lists more easily understood? I have the habit of programming in this fashion: (these two lines are simply made up):

```
  100 j=0:pokex,j:pokey,j+1:
        z=peek(x+y-j):rn=fnr(34)
  110 ifrn<zthenprint:close3:close4:end
```

Now, this usually doesn't give me any problems, but sometimes everything is so tied up in there that I can barely make sense of it all. As a result, I've often wished I had a program that would list each statement separately, and give me room on the paper to write in any changes. Simple List is just such a program, and runs on both the Commodore 64 and VIC 20 computers, with either disk drive or cassette.

Using the Simple List program, the lines above will be printed as:

```
  100 j=0:
        pokex,j:
        pokey,j+1:
        z=peek(x+y-j):
        rn=fnr(34)
  110 ifrn<zthenprint:
        close3:
        close4:
        end
```

I can easily look at each line and determine what it does, and I also have the necessary room to make any changes in pen.

How to Use Simple List

Using Simple List is very easy. First, type in the program accompanying this article and save it. Now load in the program you wish to list. We must now save it back to disk or tape in a fashion Simple List can use—as a sequential file. ("Sequential" means that the file is stored in a linear fashion, with each bit following the next. Don't let the term intimidate you.)

To do this on disk, use the following commands, substituting the name of the program in memory for "name":

```
OPEN 1,8,2,"name,S,W":CMD 1:LIST
```

When the cursor reappears, type:

```
PRINT#1:CLOSE 1
```

Cassette users must type the following, instead:

```
OPEN 1,1,1,"name": CMD 1:LIST
```

milk
eggs
brd
cereal
juice
D. Early

and again, when the cursor appears:

```
PRINT#1:CLOSE 1
```

What have we done? Basically, we prepared a file on disk or tape for receiving information ("opened" it) and then diverted screen output to that file with the CMD statement. That means that when we typed LIST, the program was listed as normal, but instead of going to the screen, it was stored on disk or cassette. The PRINT#1 then properly finishes the file, and the CLOSE statement tells the computer we have finished and that it can restore output to the screen.

Once this is done, load and run Simple List. Enter the name you gave the program when you saved it on disk or tape, and make sure your printer is on. Simple List will then proceed to input each character from the file, process it as necessary, and then send it to the printer. After each colon, a carriage return is performed, and the program lines are double-spaced. When finished, Simple List prints an end-of-listing message and returns you to BASIC.

Cassette Notes

Besides having to use a slightly different method for storing programs as sequential files on tape, line 110 in Simple List should be replaced with:

```
110: OPEN 1,1,0,PN$
```

and line 120 deleted.

How it Works

Simple List is not a complex program. Lines 50 and 60 set up certain variables. Lines 100-120 input the file name and open the sequential file for reading, checking for errors in the disk version.

Line 130 opens the printer for output—you may need to change this slightly depending upon the type of printer and interface you have (it works fine as is on a 1525/MPS-801 or a Gemini-10X with The Connection interface).

Line 140 simply skips a couple of unnecessary bytes at the beginning of the listing. Line 150 prints a listing header. Lines 160-180 get and print the line number for each line, formatting them where necessary. Lines 190 to 215 do the actual text printouts, and line 220 finishes everything off.

Final Notes

Although it isn't a terribly complex program, Simple List is useful for setting yourself straight in the middle of a complex programming job. I don't recommend using it for all your listings, but it does come in handy occasionally. C

Note: VIC 20 users should *not* include the final apostrophe and the last four letters in each program line.

Before typing this program, see "How to Enter Programs."

Simple List

```
50 CR$=CHR$(13):CO$=CHR$(58)'EPOH
60 QU$=CHR$(34):QU=0'DLNG
100 INPUT"[CLEAR,DOWN]PROGRAM NAME";
    PN$:IF PN$="QUIT"THEN END'FIYF
110 OPEN 1,8,2,PN$+",S,R":OPEN 15,8,15
    :INPUT#15,E,E$'EAME
120 IF E>20 THEN PRINT"DISK ERROR
    : "E,E$:CLOSE 1:CLOSE 15:END'HNIH
130 OPEN 4,4'BDAY
140 GET#1,A$,A$'BIXB
150 PRINT#4,"PROGRAM: ";PN$;CR$;
    CR$'BOLG
160 NS$=""'BDSC
170 GET#1,N$:IF ST<>0 THEN 220'FMFH
175 IF N$<>CHR$(32)THEN NS$=NS$+N$
    :GOTO 170'ISFQ
180 PRINT#4,RIGHT$("[SPACE4]"+NS$+"
    [SPACE2]",7);:PS$=""'FOJK
190 GET#1,X$:PS$=PS$+X$
    :IF X$=QU$THEN QU=1-QU'IAWP
200 IF(X$=CO$AND QU=0)THEN PRINT#4,PS$
    :PRINT#4,"[SPACE8]";:PS$=""'IXYH
210 IF X$=CR$THEN PRINT#4,PS$
    :IF ST=0 THEN 160'HRYF
215 IF ST=0 THEN 190'DGJF
220 PRINT#4,CR$;"END OF LISTING";CR$;
    CR$:CLOSE 4:CLOSE 1:CLOSE 15'EVEI
```

END

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BY WILLIAM AND KATHLEEN PETRONE

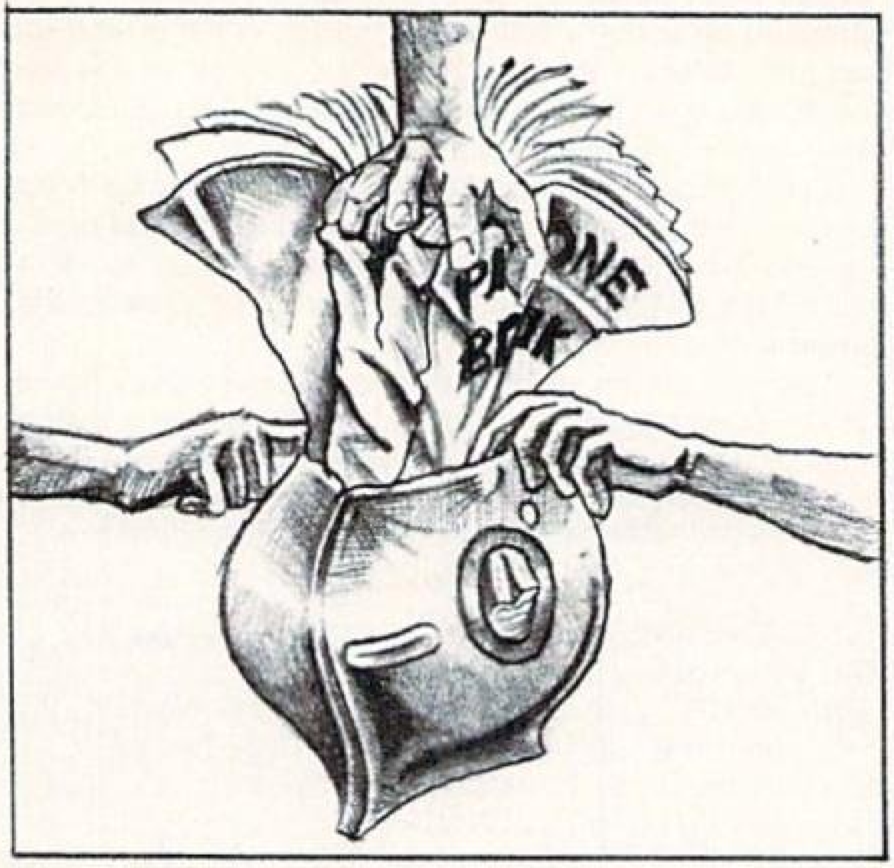
Address File for the 1541 Disk Drive

When you purchase Commodore's 1541 disk drive, you also receive a demonstration disk containing a number of useful programs. The final program on this disk is an example of a random file. This program lets you input a name, address, phone number, and a comment into a random file under a specific file number, which is then stored into a sequential file for future access. The file can hold 664 separate addresses.

As an example of a random file, this program is excellent. Unfortunately, however, the directory is too limited for useful application. But this problem is easily remedied with a minimum of program additions, thereby transforming this program into a functional and worthwhile addition to your software collection.

The additions to the program are listed at the end of this article. The key is to modify the existing sequential file routine so that the last and first name is stored instead of a "1," which is what the program previously used to designate a used file number.

With a few more additions to the program, the user can enter a name of interest and retrieve the specific file number to obtain the desired data. During the search phase it is not necessary to input a complete name; a string of any length can be used. For example, the input of a single letter will result in the output of all file numbers and names which begin with that letter. The file number(s) so obtained can then be used to extract the name and address information from the random file.



Steve Early

To scan the directory, the program enters a null string. The scan rate of the directory can be slowed by pressing the CTRL key. Also be sure to input the name into the master file as follows: last name/first name, without any intervening spaces. Do not use commas when entering data into the master file.

With these simple alterations, the usefulness of this random file program as an address filing system is greatly improved. ■

Before typing this program, read "How to Enter Programs."

Address File

(Additions to the Random File Program on the 1541 Demo Disk)

```
10 REM ************************'BXJB
12 REM * RANDOM FILE EXAMPLE *'BTHE
14 REM ************************'BXJF
16 DIM I$(664):FD=0:FX=5:CH=2
   :FP=1'FXOL
18 PRINT"[CLEAR,DOWN2,SHFT F22]"'BAEX
20 PRINT"[SPACE2]INSERT DATA
   SHEET"'BASD
22 PRINT"[SHFT D21]"'BASQ
24 PRINT"[DOWN2,SPACE4]
   START PRESS 'S'"'BARH
26 GET P$:IF P$<>"S"THEN 26'FHVJ
28 OPEN 15,8,15,"I0":OPEN 2,8,2,
   "#"'CPPK
30 PRINT"[CLEAR,DOWN,SHFT F22]"'BAMR
32 PRINT"INDEX FILE OPERATION"'BABH
34 PRINT"[SHFT D22]"'BAJU
36 INPUT"[DOWN,SPACE5]NEW SHEET? N
   [LEFT3]";O$:PRINT""'CECM
38 IF O$="N"THEN 46'DEQK
40 IF O$<>"Y"THEN 36'EEDD
42 PRINT:PRINT"[SPACE4]WAIT!"
   :FOR I=1 TO 664'FHMI
44 PRINT"[HOME,RIGHT10,DOWN9,SPACE4,
   LEFT5]"I;:I$(I)="/"'CINM
45 PRINT I$(I):NEXT:GOTO 50'DJGI
46 OPEN 5,8,5,"0:INDEX,S,R"'BGYK
47 FOR I=1 TO 664:INPUT#5,I$(I)'ENXM
48 PRINT I;" ";I$(I)'BIBK
49 NEXT I:CLOSE 5'CDRK
50 PRINT"[CLEAR,DOWN,SHFT F22]"'BAMT
52 PRINT"[SPACE5]JOB MENU[SPACE8]
   "'BALH
54 PRINT"[SHFT D22]"'BAJW
56 PRINT'BACH
58 PRINT"[SPACE5]1=CREATE"'BAXM
60 PRINT"[SPACE5]2=DELETE"'BAXF
62 PRINT"[SPACE5]3=SEARCH"'BACH
64 PRINT"[SPACE5]0=END"'BAEI
65 PRINT'BACH
66 INPUT"1 , 2 , 3 , 0[SPACE3]1[LEFT3]
   ";O$'BDAN
68 IF O$="0"THEN CLOSE 15:CLOSE 5
   :CLOSE 2:END'HJXQ
70 IF O$="1"THEN 104'DFEG
72 IF O$="3" THEN 8000'DGHI
74 IF O$<>"2"THEN 50'EEKK
76 GOTO 200'BDBK
100 REM ************************'BXJY
102 REM * MASTER FILE CREATE  *'BSFC
```

```
103 REM ************************'BXJC
104 PRINT"[CLEAR,DOWN2,SHFT F22]"'BAER
105 PRINT" [SHFT SPACE]
    MASTER FILE CREATE"'BAXG
106 PRINT"[SHFT D22]"'BAJS
107 INPUT"RECORD NO. = 0[LEFT3]";
    F'BCPI
109 IF F=0 THEN 170'DFQG
110 INPUT"NAME[SPACE5]=.[LEFT3]";
    FB$(1)'BHYB
120 INPUT"ADDRESS[SPACE2]=.[LEFT3]";
    FB$(2)'BHFD
130 INPUT"ZIP[SPACE6]=.[LEFT3]";
    FB$(3)'BHLD
132 INPUT"TEL[SPACE6]=.[LEFT3]";
    FB$(4)'BHXF
134 INPUT"COMMENT[SPACE2]=.[LEFT3]";
    FB$(5)'BHVI
140 GOSUB 5200'BEIA
150 I$(F)=FB$(1)'BLCC
160 GOTO 104'BDEC
170 OPEN 5,8,5,"@0:INDEX,S,W"'BGTG
175 FOR I=1 TO 664:PRINT#5,I$(I);
    CHR$(13);'FTDO
180 PRINT I;" ";I$(I)'BIBF
185 NEXT:CLOSE 5'CCTJ
190 GOTO 74'BCSE
200 REM ************************'BXJA
201 REM *  MASTER FILE DELETE *'BSEC
202 REM ************************'BXJC
210 PRINT"[CLEAR,DOWN2,SHFT F22]"'BAEP
212 PRINT"[SPACE2]MASTER FILE
    DELETE"'BAYE
214 PRINT"[SHFT D22]":PRINT'CBOT
220 INPUT"RECORD NO. = 0[LEFT3]";
    F'BCPE
230 IF F=0 THEN 260'DFQB
235 IF I$(F)<>"1"THEN 220'EIUI
240 I$(F)="/":PRINT"[DOWN]
    RECORD NO."F;"DELETE"'CIHH
250 GOTO 220'BDDC
260 OPEN 5,8,5,"@0:INDEX,S,W"'BGTG
265 FOR I=1 TO 664:PRINT#5,I$(I);
    CHR$(13);'FTDO
270 PRINT I;" ";I$(I)'BIBF
275 NEXT:CLOSE 5'CCTJ
280 GOTO 50'BCME
300 REM ************************'BXJB
301 REM *  FILE SEARCH          *'BMJB
302 REM ************************'BXJD
310 PRINT"[CLEAR,DOWN2,SHFT F22]"'BAEQ
312 PRINT"[SPACE7]SEARCH[SPACE7]"'BAVE
314 PRINT"[SHFT D22]":PRINT'CBOU
320 INPUT"RECORD NO. = 0[LEFT3]";
    F'BCPF
321 IF F=0 THEN 50'DEPC
322 IF I$(F)="/" THEN GOTO 320'EIDF
325 GOSUB 5100'BEHF
360 PRINT"NAME[SPACE2,SHFT SPACE2]
     = ";FB$(1)'BHNI
370 PRINT"ADDRESS[SPACE2]= ";
    FB$(2)'BHXI
380 PRINT"ZIP[SPACE3,SHFT SPACE2] = ";
    FB$(3)'BHAK
382 PRINT"TEL[SPACE3,SHFT SPACE2] = ";
    FB$(4)'BHNM
383 PRINT"COMMENT[SHFT SPACE] = ";
    FB$(5)'BHMN
385 PRINT"-----------------------"'BATO
390 GOTO 320'BDEH
5100 REM ************************'BXJC
5105 REM * FDD BLOCK READ       *'BOFH
5108 REM ************************'BXJK
5110 GOSUB 5330'BEMA
5120 PRINT#15,"U1:";CH;FD;FT;FS'BPHF
5130 PRINT#15,"B-P:";CH;FP'BJOE
5140 GOSUB 5270'BEPD
5150 FOR FI=1 TO FX'DFCG
5160 INPUT#CH,FB$(FI):'BLBH
5180 NEXT'BAEG
5190 RETURN'BAQH
5200 REM ************************'BXJD
5201 REM * FDD BLOCK WRITE      *'BPQE
5202 REM ************************'BXJF
5210 GOSUB 5330'BEMB
5220 PRINT#15,"B-P:";CH;FP'BJOE
5230 FOR FI=1 TO FX:PRINT#CH,FB$(FI);
     CHR$(13);:NEXT'GXWK
5240 PRINT#15,"U2:";CH;FD;FT;FS'BPII
5250 GOSUB 5270'BEPF
5260 RETURN'BAQF
5270 REM ************************'BXJK
5275 REM *  ERROR CHECK         *'BMCO
5278 REM ************************'BXJS
5280 INPUT#15,EN,EM$,ET,ES'BPUL
5290 IF EN=0 THEN RETURN'EDCL
5300 PRINT"ERROR STATUS
     :";EN;EM$;ET;ES'BNKH
5310 INPUT"CONTINUE?";Y$
     :IF Y$="Y"THEN RETURN'FGII
5320 STOP'BASC
5322 REM ************************'BXJI
5324 REM * SET TRACK & SECTOR  *'BRHL
5326 REM ************************'BXJM
5330 IF F<358 THEN F1=0:F2=22:F3=1
     :GOTO 5370'HVUM
5340 IF F>357 AND F<472 THEN F1=357
     :F2=20:F3=19:GOTO 5370'JDBP
5350 IF F>471 AND F<580 THEN F1=471
     :F2=19:F3=25:GOTO 5370'JDAQ
5360 IF F>579 THEN F1=579:F2=18
     :F3=31'GTYO
5370 FT=INT(((F-F1)-1)/(F2-1))+F3'HTWP
5380 FS=F-F1-(FT-F3)*F2+(FT-F3-1)'IUMS
5390 RETURN'BAQJ
8000 PRINT"[CLEAR]"'BATB
8005 INPUT "LAST NAME/FIRST";AN$'BEWK
8010 NA=LEN(AN$)'CHIE
8020 FOR L=1 TO 664'DFSE
8025 N1$=I$(L)'BITJ
8030 N2$=LEFT$(N1$,NA)'CLEG
8045 IF AN$=N2$THEN PRINT "FILE#=";L;
     "NAME=";N1$'ENRR
8046 NEXT'BAEK
8050 INPUT "ANOTHER NAME Y/N";II$'BEDK
8060 IF II$="Y"GOTO 8005'DHMJ
8070 GOTO 300'BDCI
```

END

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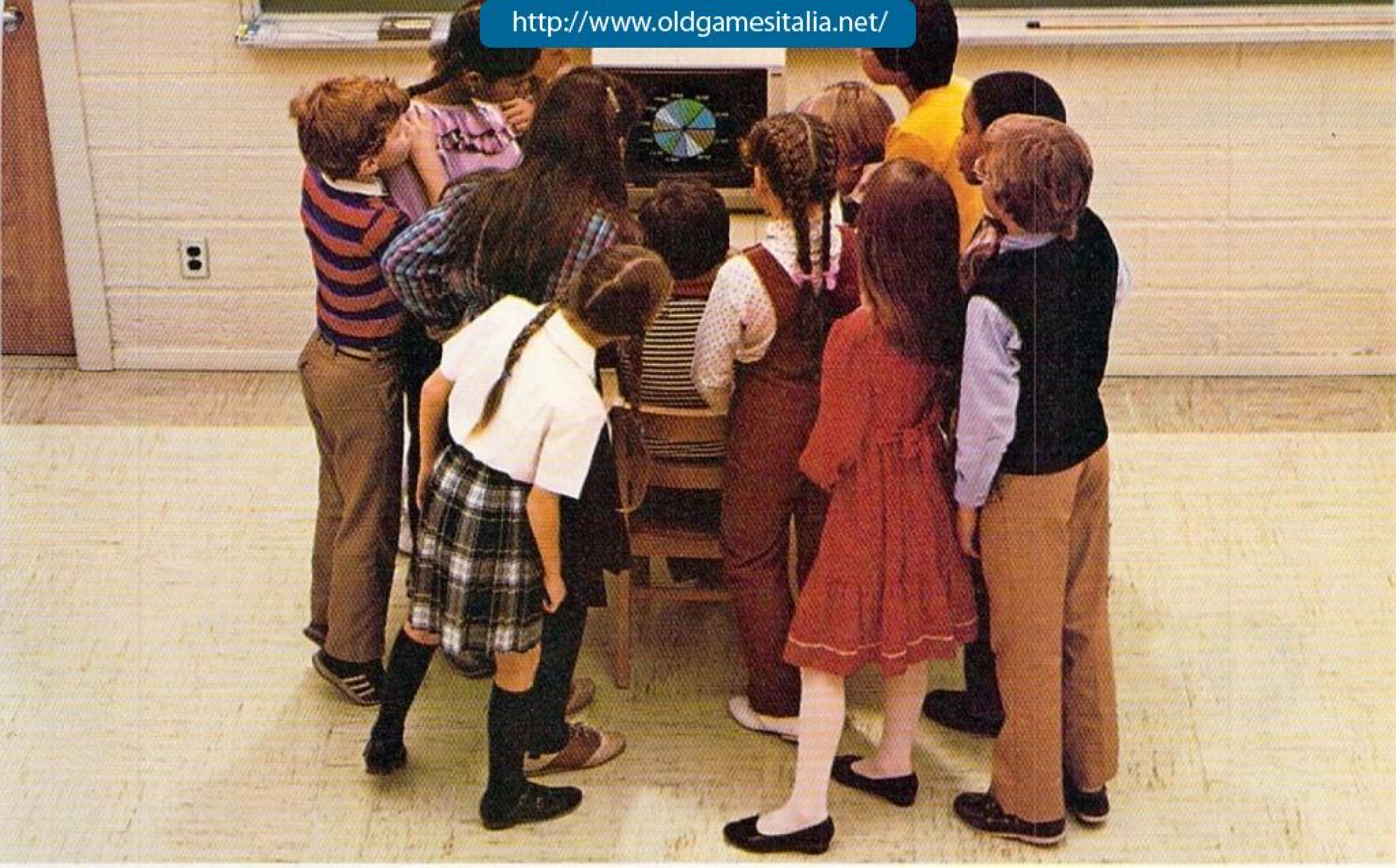
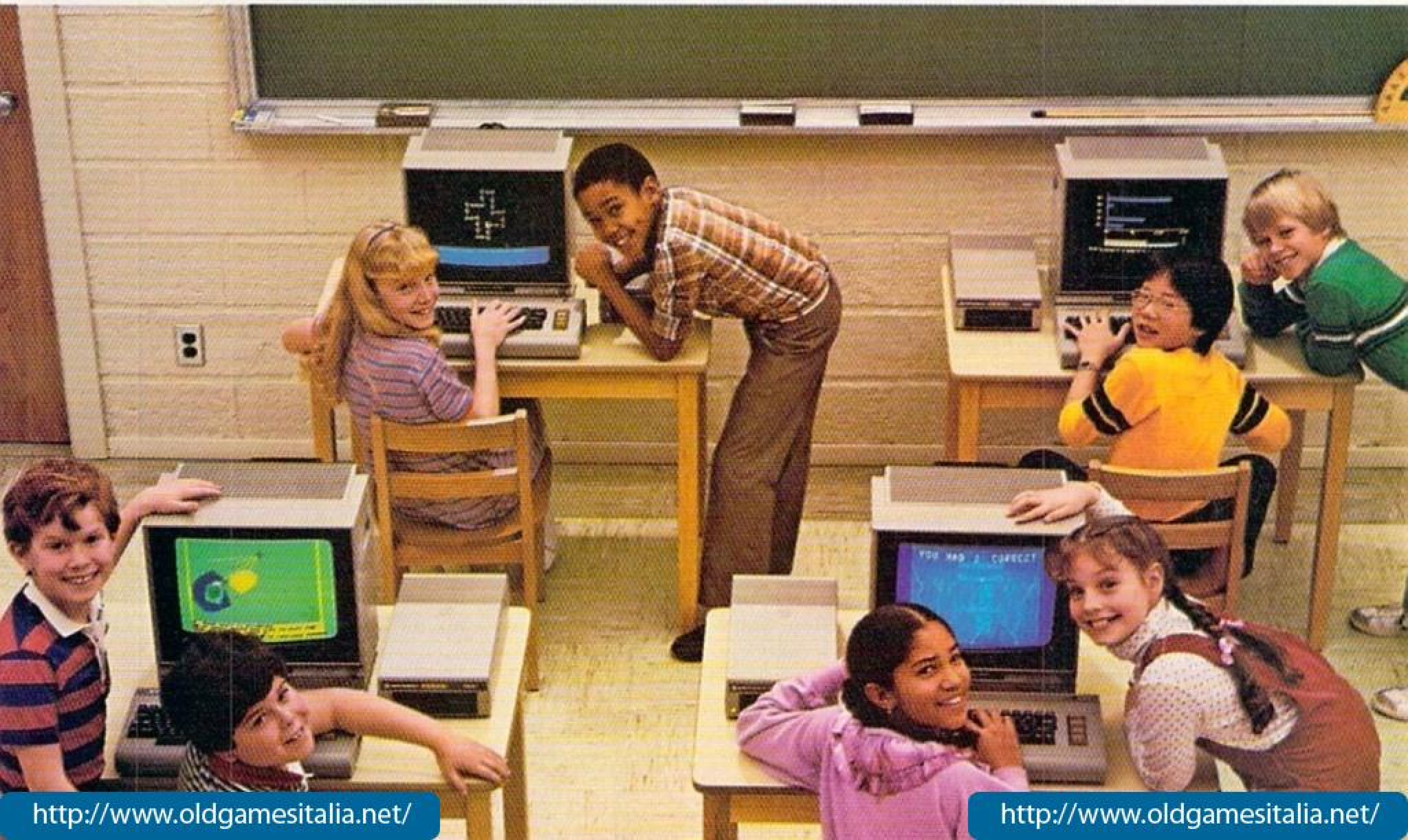


WHY THE COMMODORE 64 ISN'T IN A CLASS BY ITSELF.



THE MAKING OF CHIPWITS

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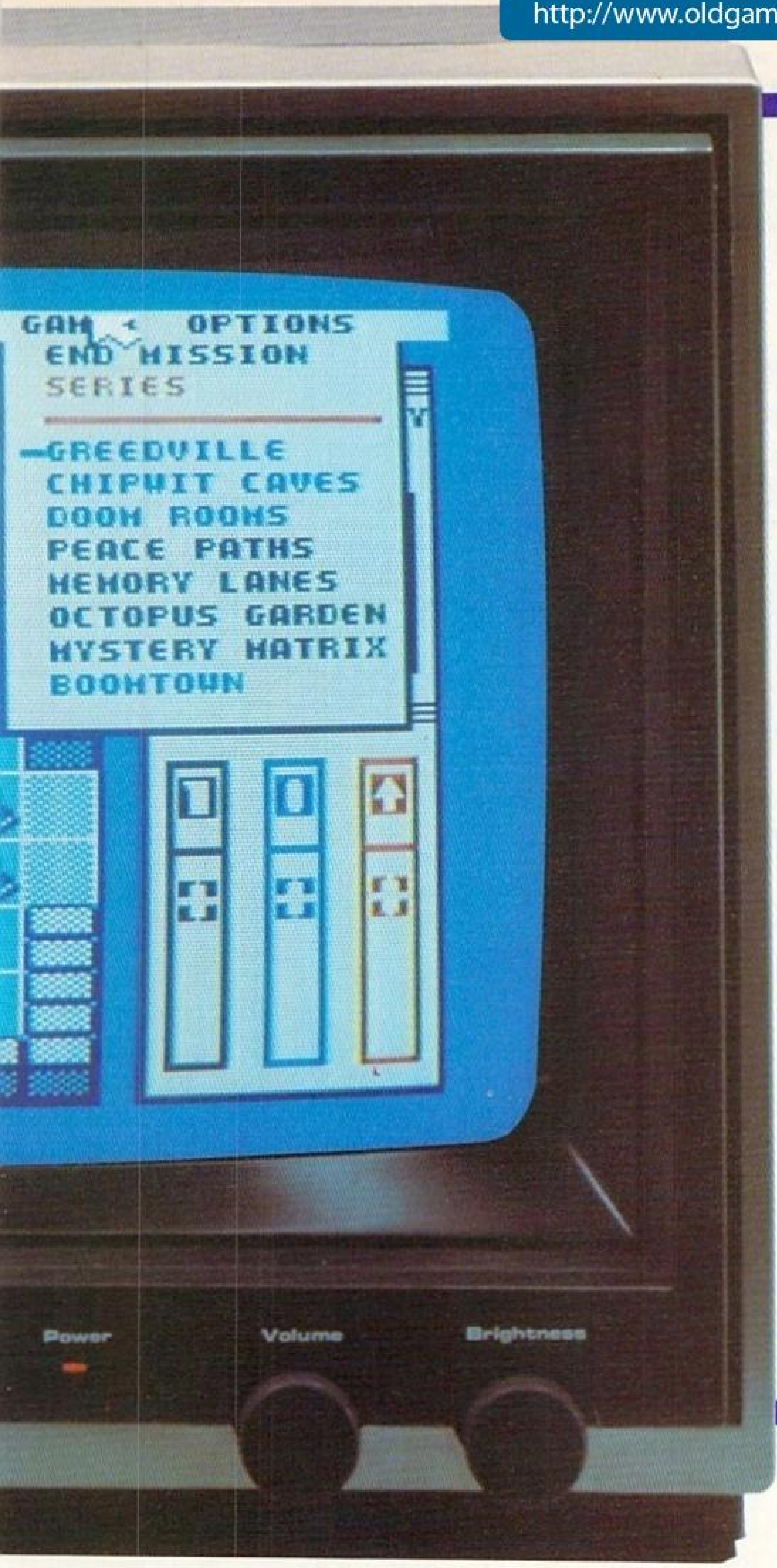
A GAME THAT TEACHES PROGRAMMING CONCEPTS, *CHIPWITS* IS AVAILABLE FROM EPYX FOR THE COMMODORE 64. HERE'S HOW THE GAME EVOLVED, FROM A VAGUE IDEA IN THE MINDS OF TWO MINNESOTA TEACHERS TO ONE OF THE HITS OF THE 1985 WINTER CONSUMER ELECTRONICS SHOW.

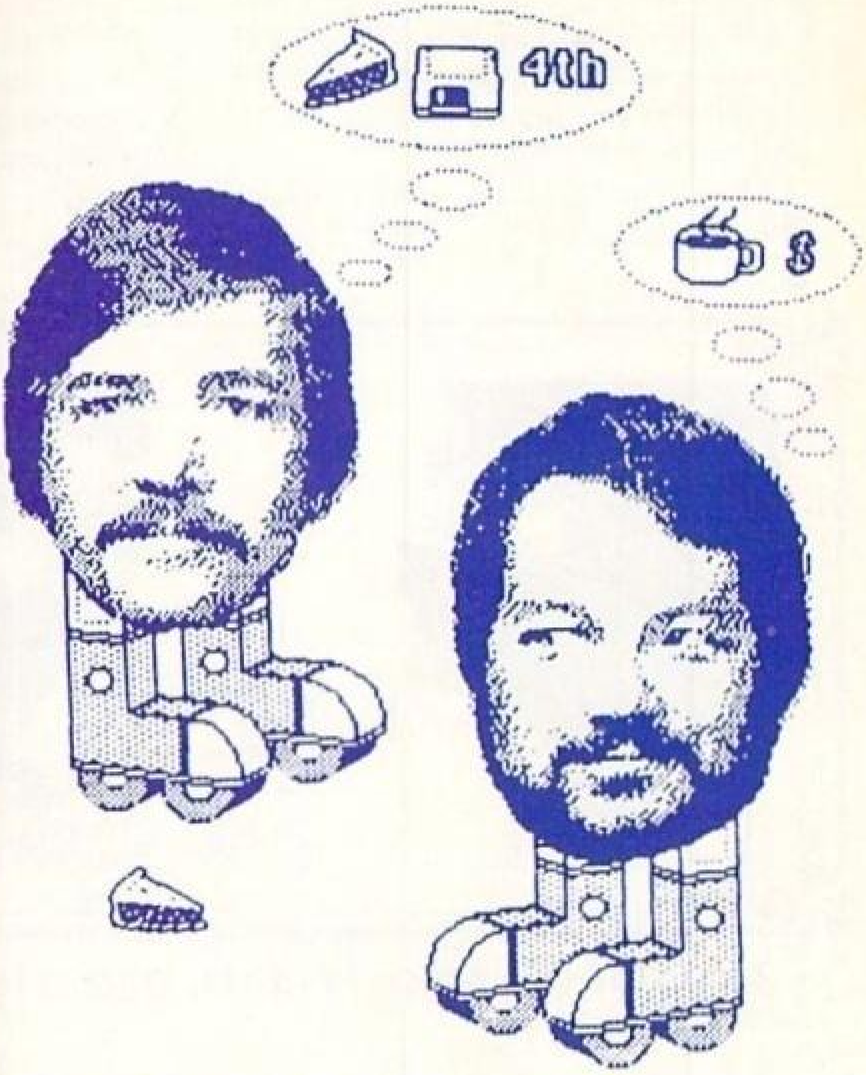
BY KELLYN BEECK

It was the final day of the 1985 Winter Consumer Electronics Show in Las Vegas, and Mike Johnston was chatting with a television crew from The New Tech Times. Chipwit, the loveable little robot with the red high-top sneakers, had emerged as one of the bright stars of the show. The authors of *Chipwits* were basking in the glow of recognition from friends and competitors alike.

Word had spread about the new robot game during the first three days of CES, and now it was bathed in television lights. The camera crew was shooting *Chipwits* for a show about so-called "breakthrough" software—products that represented new directions for the medium. Mike and his partner, Doug Sharp, would later reflect on the warmth of their game's reception with mild astonishment. After all, less than six months before, they had still been working on an arithmetic game for a company that was on its way to extinction, and Chipwits was little more than a vague idea about robots and ping pong.

Chipwits wasn't exactly a rush job, but it wasn't "ten years in the mak-


GAM OPTIONS
END MISSION
SERIES
GREEDVILLE
CHIPWIT CAVES
DOOM ROOMS
PEACE PATHS
MEMORY LANES
OCTOPUS GARDEN
MYSTERY MATRIX
BOOMTOWN
Power
Volume
Brightness



chip wit (chĭp' wĭt) n. 1. A short, squat robot wearing sunglasses and red tennis shoes, and having a predilection for pie, coffee and computer disks. 2. Something suggestive of the endearing qualities of a chipwit; esp. in persons; as a *chipwit off the old block,* a person who is as loveable as a chipwit.

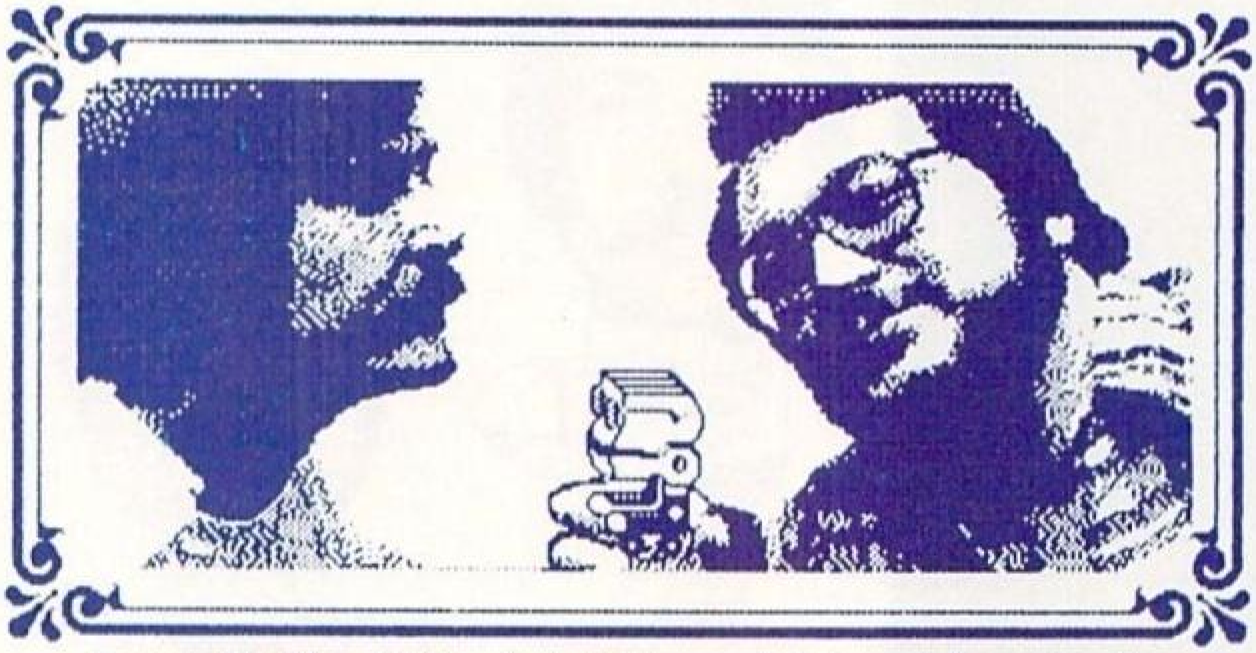
ing,'' either. Authors Doug Sharp and Mike Johnston started the project early last summer when the steady flow of contract programming work they had enjoyed in Minneapolis suddenly ran dry.

They had been working together as consultants since 1982, when Doug was a student in one of Mike's classes at the University of Minnesota. Doug, a former elementary school teacher, and Mike, a doctoral student in computer-based education, joined forces and started writing conversions of educational software for Control Data Corporation and Science Research Associates. It was good money for a while, but eventually other programmers began offering to do the same work at a lower price. No problem, said Doug. Right, said Mike. We'll just write a megahit computer game and become instant millionaires. Isn't that what everybody's doing these days?

It takes guts to thumb your nose at a weekly paycheck and start programming a game on speculation, hoping that eventually you'll find a publisher and make some money. But that's exactly what our heroes did.

Mike, 29, and Doug, 32, turned to their very professional wives (a physician and an editor) and said, "Listen, honey, we're going to risk everything on a wild, irresponsible fling at becoming software superstars"—or something worded for better effect—and the die was cast.

Mike and Doug have very understanding spouses.



Doug (left), Mike (right), and friend (center).

That Robot Game

For the uninitiated, *Chipwits* is a game that teaches children (and a select group of inquisitive, truth-seeking, freedom-loving adults) the basics of computer programming. In the game, you program a robot's brain using icons that represent its various functions—turn left, move forward, look for a door—then you watch the robot perform in a variety of adventures on your screen. After viewing your robot's performance, you can return to the workshop to improve its program.

Each adventure is a series of rooms filled with good objects and bad objects. Pie, coffee, oilcans, and computer disks are good. Chipwits love to eat these objects. Electro-crabs, bouncers, and bombs are bad, and must be zapped or avoided. In order to cope with the variety of things it encounters, a Chipwit has a powerful array of commands which allow it to explore rooms, recognize objects and decide what course of action to take. You decide how to put the commands together. At its simple level, a Chipwit can move, turn, and look, using functions even a young child can understand. On the other hand, an expertly programmed Chipwit can follow mazes, react to new situations and remember where it has been. A Chipwit is as intelligent as you make it.

Of course, none of this had yet taken shape in the authors' minds as they contemplated their first step toward software success. It was February, 1984, and they still had three months of work left on an arithmetic drill game before they could start their First Big Project. It was time to begin discussing what that project would be.

At this point, Doug and Mike referred to *Chipwits* simply as "that robot game." In the game's original design, one or two players were to program robots to compete against each other in contests like soccer and *Pong*. Doug planned to make the screen a "first-person" view where you would see things from the robot's perspective. Aside from these two ideas (which would later change), most of the game was still undefined. The authors were sure of only one thing: Their game would be educational.

"Both of us are teachers," says Mike. "We got into software development from an educational angle. We might be able to run off and do something that was purely entertainment and make a lot of money, but we'd rather do something educational in an entertainment context. I refuse to segregate those two things. As long as we do this, we'll stay with educational games."

Their primary goal determined, the next decision confronting Doug and Mike was the choice of a theme. They already had a general topic in mind, but they were having trouble narrowing it down.

Several games influenced the authors during the early stages of *Chipwits'* development, games the pair admired and spent many hours playing. *Rocky's Boots* and *Robot Wars* headed the list, and they share two things in common: Both are entertaining games that teach you something about computers. This idea defined the type of game Doug and Mike wanted to design. But what would be its theme?

Doug argued for a robot game, foreseeing the power and flexibility that would result. "I don't like to sit at a

GAME REVIEW

CHIPWITS

Computer: Commodore 64
Publisher: Epyx
1043 Kiel Court
Sunnyvale, CA 94089
Medium: Disk
Retail Price: Not available

Epyx has come up with a terrific way to teach the basic concepts of how computers work: a charming one-player game called *Chipwits* that can be played through either a joystick or a KoalaPad.

The starring characters are robots, 16 of them in all. These loveable little characters are programmed by the player to negotiate various rooms and accrue points. Different objects are found in the rooms, including oilcans, disks, bombs, electro-crabs, and coffee and pie. Some items are good: disks and oilcans are good and accrue points; pie and coffee are good and provide energy for the Chipwits. Other items are bad: electro-crabs injure the Chipwits, and encountering a bomb is even worse: they destroy robots.

Chipwits is controlled largely through icons, which makes it ideal for younger players. Four pull-down menus are used: Warehouse, Workshop, Games, and Options. These menus are activated by directing an arrow-shaped cursor to the desired menu and depressing the fire button. Holding down the button pulls down the menu, and selections are then made by moving the arrow to the de-computer and have stuff shoved down my throat," he says. "Too much educational software falls into that category. I liked the idea of customizing a helper to lead me to the things I wanted to learn—creating my own teacher that knows the things I like and don't like."

This would become the foundation of *Chipwits*—the idea of a robot that would teach you about programming while you taught it how to survive in a series of games, a robot that would be both teacher and slave. You'd program the robot with a special language, a set of symbols representing the functions it was capable of performing. This would reduce the high-tech jargon of computer programming to a set of visual images anyone could understand.

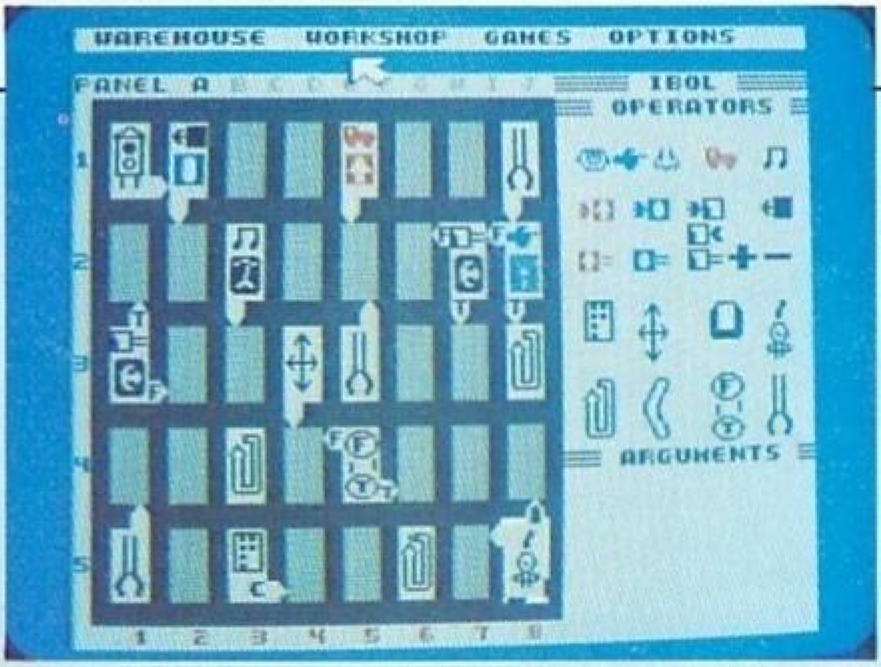
Mike, too, saw the power of the concept. He explains, "When you create a Chipwit, the process is internally motivating. When you see an error, you know that it's an error you made. So you're motivated to fix it. The process is also adaptive—the robots are only as good as you create them. You can't create anything you don't understand, so you proceed at your own pace."

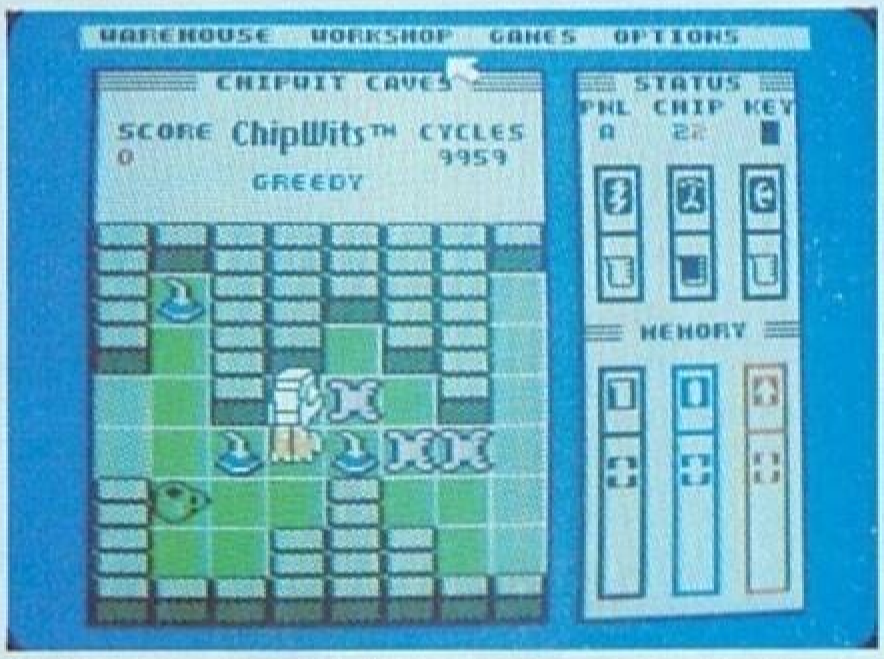
While they set about putting the design on paper, the hunt for a programming language began.

Going Forth

Choosing a development language is never easy, especially when you're contemplating a project for multiple computers. Doug and Mike planned to develop "that robot game," as they were still calling it, for several different computers. Programming the game in assembly language would mean rewriting the game for each different computer—a time-consuming process, and time was a precious commodity. Faced with these restrictions, the authors narrowed their choices to three high-level languages:

REVIEWED BY TOM BENFORD





SIXTEEN CHIPWITS ROBOTS "LIVE" ON THE DISK AND EACH MAY BE TAUGHT TO PLAY ANY OF EIGHT DIFFERENT GAMES.

sired item. Releasing the button activates your choice.

A demonstration game is provided that introduces Greedy, one of the Chipwits, who acts as your guide. This demo game puts Greedy in Greedville, one of eight different games that may be selected. This "Greedy in Greedville" game is an adventure that covers four individual rooms. Greedy and the other Chipwits are capable of finding the doorways to move from room to room, provided they are programmed to do so. That's where the player comes in: the objective of the game is to program the Chipwits to negotiate obstacles, scarf up goodies, and traverse the different rooms of each adventure. Oh yes—don't forget to program them to eat all the pie and coffee they can because these foods provide energy for the Chipwits and the game is over when they run out of energy.

The Chipwits are programmed in IBOL, which stands for Icon Based Operating Language. IBOL provides symbolic operators and arguments, which are surprisingly easy to learn. When programmed with IBOL, the Chipwits can move, feel, see, smell, grab, zap, and remember things—even sing songs!

IBOL has symbolic operators which will direct the robot to look for things, move or turn, smell for an object (like coffee or pie), feel for an object, pick up an object, or zap an offending object. A "coin-flip" operator is also included so the Chipwits may "flip a coin" to decide on its next course of action. This feature is valuable in teaching the principles of computer randomization.

Another novel feature is the "boomerang," which functions much like a GOSUB in BASIC. It allows the program to return to the main panel from a subpanel at any time. This operator especially comes in handy on the more complex play levels.

Complex movement and operational patterns may be created and stored using the "save" operator. Three memory stacks are provided, one each for numbers, moves, and things. Each stack will hold up to 256 arguments, so highly complex programs are possible, and adding an item to a stack will cause the top item to move down one place in the stack. This feature is useful for understanding how memory is managed inside a computer.

The symbols provided in IBOL are used to create the programs for the Chipwits. The programming is done

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Pascal, C, and Forth. Mavericks are mavericks (one of Doug's favorite pastimes is cross-country skiing in the middle of the night at a Minneapolis golf course), so they chose the maverick of computer languages: Forth.

While that decision was being made, the aspiring artists assayed their next game-design problem. They knew *Chipwits* would be a robot game, but they weren't sure what to do with the robots. Sitting down with a blank sheet of paper, the partners tried to come up with a list of scenarios in which general-purpose robots could compete.

Perhaps, they thought, the game could include a variety of scenarios appealing to a broad range of people. And if it was successful they could keep coming out with new scenario disks ad infinitum, disk after disk, until the robot game had 1,001 different scenario disks. They'd be famous. And rich. Rich and famous.

Brains storming, imaginations in high gear, Doug and Mike scribbled down the places where robots might be able to compete. A soccer field, offered Doug. A tennis court, suggested Mike. A racetrack. An obstacle course. A battle arena. Mazes. The list began to grow.

Before long, the list assumed epic proportions. The pair of programmers had enough ideas for dozens of games. Trouble was, they were planning to write just one game. Reality began crinkling the edges of their excitement. No ordinary general-purpose robots would be able to function in such a large variety of situations. These robots would have to be *intelligent*.

The calendar on the wall read "March." How could they create a language powerful enough to program intelligent robots for so many different environments and still get their game out in time for Christmas? The answer was apparent. They couldn't. Now, Mike and Doug really had a problem. They would have to narrow the game's scope without narrowing its appeal, and that was a tall order.

"That robot game" was beginning to look like a misdirected concept. A good idea with nowhere to go. Then Mike came up with a solution.

It was pretty simple, really. But it solved three problems with one bold stroke. In the first place, Doug and Mike needed a way to make their game different from everything else on the market. Not just out of the ordinary, but unique. Doug and Mike knew they faced high odds against finding a publisher, and even higher odds against success once the game was published. The educational software market is crowded, and they wanted *Chipwits* to stand out from the competition.

> **"Mike and I are not 'traditional' programmers. I guess you'd say that we do 'folk programming.'"**

In the second place, they needed an environment for the robots that offered a range of interesting possibilities. Contests like soccer and *Pong* offered nothing more than a set of predictable interactions with a bouncing ball. And finally, they needed something they could program in less than six months.

Adventures. That was Mike's solution. Adventures with a single, solitary robot. Instead of programming robots to compete against each other on a soccer field, why not program one robot for an adventure? Each adventure could be a series of rooms filled with different objects or characters. The robot would need to be able to recognize and interact with them successfully. This framework was flexible enough to include many possibilities, yet simple enough to program in a reasonable amount of time.

At last, the project was defined. Now they could start filling in the details. The month of April was spent developing the language that would control the robots. Or, to be more precise, certain snippets of April were spent this way. All of the design work on *Chipwits* was carried out while Doug and Mike finished other projects.

The arithmetic game was finally completed in May, and Doug began programming *Chipwits* on a full-time basis. He liked Forth immediately. The unstructured environment of the language appealed to Doug's sensibilities. He claims Forth lets you get close to the machine. Of course, he also insists that his toast no longer burns *and* that his car always starts on cold mornings now that he is programming in Forth.

As former teachers, the authors of *Chipwits* take an unusual approach to programming. Doug explains, "Mike and I are not 'traditional' programmers. We were never trained in computer science and we probably do things a little differently. I guess you'd say that we do 'folk programming.' "

Doug wrote his first program while employed as a fifth grade teacher in Minnesota. Taking a computer home on weekends, Doug taught himself the rudiments of programming so that he could instruct his young charges how to master the intricacies of the meandering GOTO, the ubiquitous IF/THEN and the indomitable FOR-/NEXT.

Mike's first exposure to computers came at the University of Texas. A French and linguistics major, Mike was given the task of designing Arabic script on a graphics terminal for use in teaching students how to write in Arabic. "Playing with computers" was so much fun that he started digging into wastebaskets, looking for passwords on discarded printouts. It was the only way a French major could get computer time. Soon, Mike began learning how to program and by the time he graduated, he was an expert.

While Doug went ahead with the game, Mike accepted one last programming contract. Suppressing his eagerness to work on *Chipwits*, he recognized the need to keep money coming in while they worked on the project.

As the month of June arrived, two things happened that would have a tremendous effect on the game. The first took place as Doug and his wife Inga drove from Minneapolis to Philadelphia for a wedding. Somewhere on I-80, the little robot with the shades and high-tops came into the world. While Inga drove, Doug sketched robots on a note pad. Using only one sheet of paper, he filled every corner with robot drawings until he was satisfied with his design.

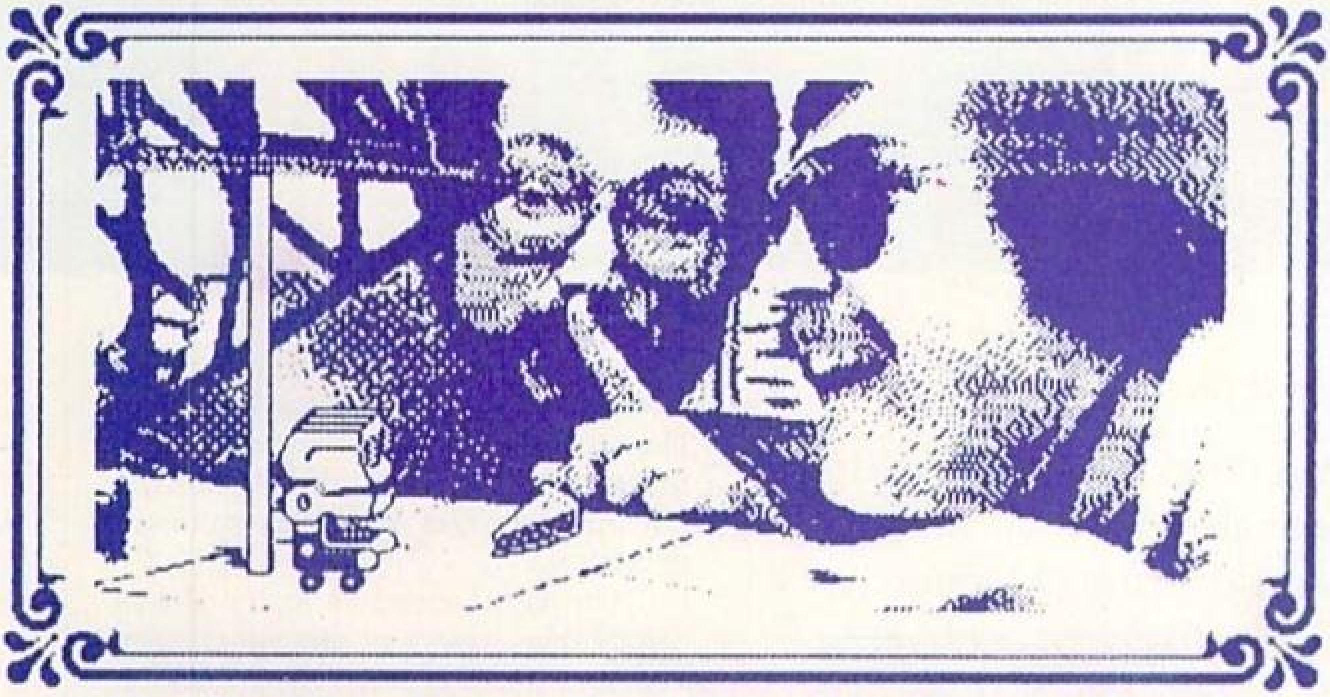
Neither Doug nor Mike had tried to design robots for their game before this moment, and Doug's design would remain unaltered henceforth.

Although he had yet to receive his name, Chipwit had arrived.

June's other momentous event came as a jolt to the budding game designers. They had hoped that no one else would think of producing an educational robot game, at least not until long after *Chipwits* was safely on the shelf at the computer store in your neighborhood. But the June Consumer Electronics Show brought the announcement of a new game called *Robot Odyssey*.

To Mike, who had feared that someone would beat them to the punch, this was the worst possible news. "I was a little skeptical of our chances from the start, and the announcement of *Robot Odyssey* in June shook me up. I said to myself, 'Gee, we've been scooped.' But we intentionally never looked at it, and we just started working harder."

Nothing could have provided more effective motivation. Mike and Doug redoubled their efforts, and soon, a diminutive besneakered robot was wheeling around on the computer screen. In like fashion, the robot's control language was taking shape. The form of the language evolved as the game progressed; when the authors knew what the rooms would look like, they could then visualize how the robot would move around inside the rooms, and so forth. A set of symbols began emerging, incorporating the basic principles of computer programming in a graphic language.



Mike (left) and Doug (right) set the ChipWit trap.

This had been their goal from the beginning: to translate the technical commands of programming languages into the language of pictures, a language that people can easily understand. People think in pictures, and Mike had theorized that since computer programming is a thought-intensive process, people would be better able to grasp its concepts if they were represented by symbols instead of words.

Chipwits got his name one day when Doug was reading letters to the editor in a computer magazine. For one reason or another two words stood out from the final paragraph: "chip" and "wit."

Thus, the robot's command to "look" would be symbolized by an eyeball, "smell" would be represented by a nose and the "feel" command would be a hand with the index finger extended as if to touch something.

At this point, the authors felt their new language should have a name. "We wanted a name for the language that was a play on words," says Mike. One of the robot's commands suggested an obvious possibility. "IBOL seemed like a cute name, so we adopted it. But we never really finalized what it stood for," he adds. "In fact, to this day we don't know what it stands for—maybe Icon-Based Operating Language."

It was also time for "that robot game" to receive a name. The partners say they never sat down and tried to think of a name, never made lists of possibilities, and never tossed names back and forth to try them out. Instead, *Chipwits* got his name one day when Doug was reading letters to the editor in a computer magazine. One letter in particular held his attention. And for one reason or another, two words stood out from the final paragraph.

"Chip" and "wit."

Serendipity

Things were moving quickly as August arrived. Enough of the game was functioning for Doug and Mike to start showing it to publishers. Before they did that, however, the pair decided to talk to an agent.

Contacting the Robert Jacob Agency of Thousand Oaks, California, the two authors asked a few questions to find out if working with an agent would make their task any easier. Bob Jacob convinced them that yes, he would not only make their lives much easier, but he would also make them rich and famous. Doug and Mike gave their new agent a copy of *Chipwits* and settled down for the long wait while he started making the rounds of software companies.

He found a publisher within a week.

To their astonishment, not one but two companies showed an immediate interest in *Chipwits*. This was extremely fortunate, since Mike and Doug hoped to release their game in time for Christmas.

Epyx, one of the companies interested in the game, negotiated for the rights to the Commodore 64 version, promising to release it as soon as it was finished, probably in January or February.

Back in Minneapolis, Doug began putting the finishing touches on the game. One of the last problems he and Mike faced was narrowing down the list of objects that would appear in the rooms. There would, of course, be several menacing objects for the robot to avoid, like bouncers and electro-

Continued on pg. 122

Software Protection:

Is the Cure Worse than the Disease?

By Howard Millman

Faced with mounting losses from pirates, publishers are employing increasingly sophisticated software security schemes. And hackers gamely rise to the challenge by eagerly breaking the codes. To pirates it's a contest, to users a "convenience," to publishers a crime. Can everyone be right?

Software Snatching: Larceny at Arm's Length?

Most software snatchers fit into one of three types. First is the user who casually copies a disk using a commercial "archival" copy program. These copies, in turn, are generally given to friends or exchanged among user group members. These pirates are not professionals and generally their underlying motive is in getting something for nothing.

Although the losses from these casual exchanges are by no means trivial, the frequency of these all too common transactions usually preclude prosecution. Reluctantly, publishers tolerate the frustrating losses. They, like the record industry, recognize the irritating inevitability of lost income because of these part-time software shoplifters.

There is a second category of disk duplicator: the serious users who copy programs exclusively to back up their own important data and program disks. These users are not pirates; if duplicated disks are not sold or exchanged, but archived, then it's not piracy. The third brand of pirate is of far greater concern—the wholesale bootlegger who copies a program, photocopies the manual, and sells them for profit.

Often hundreds, sometimes thousands, of illegal copies flood the legitimate market. Precisely because of the

Steve Early

potentially exhorbitant losses, publishers will vigorously pursue prosecution to recover lost revenue. And with the FBI's help available in investigations, publishers are often successful in winning convictions. With fines running as high as $50,000 for repeat offenders, a bootlegger has to peddle a pile of programs to pay that penalty.

Although bootleggers are a numerical minority among pirates, their impact is disproportionately great. Why are they so successful? Why, beside cost savings, do legitimate users knowingly buy black market copies? Part of the blame apparently lies with the industry itself.

See if this sounds familiar. You (or an acquaintance) purchase a program that doesn't perform as expected. Maybe it's a game that tires, a word processor that plods, or a utility that's tedious. Or perhaps the hype on the box was misleading, the advertisements too glowing, or the salesman's assurances too promising. But the bottom line is that you feel misled. You paid good money and bought a gripe. The result is that you're not so willing to pay that kind of money next time around. And you're susceptible, then, to pirated software.

Maybe if retailers were more knowledgeable, demo disks more readily available, and advertisements more specific—so end users were more secure about purchasing software—pirating wouldn't be so lucrative. Or maybe it wouldn't be so prevalent if disk duplicators didn't view it as a victimless crime. In their eyes, every software publisher shares one common feature—they're all a remote, intangible non-entity. It's easier to defraud at a distance.

And how do publishers react to these ripoffs? Do they price their products higher? You bet! Industry sources estimate that software costs, in a truly utopian market, would be reduced 20% to 40% below current prices.

And Now a Word from the Sponsors

Lindsay Swartz, Director of Corporate and Legal Affairs for Batteries Included, would like to see the stalemate

> *Industry estimates claim that between four and ten illegally copied programs are circulating for every one sold.*

Lindsay Swartz of Batteries Included: "The jury is still out" on their unprotected *Homepak* software.

broken. As testimony to their commitment, they have released *Homepak*, a non-protected integrated software package retailing for a modest $49.95. By offering three popular productivity programs at a competitive price, they hope to reduce the incentive to duplicate programs.

At the time of our discussion, *HomePak* hadn't been released long enough to accurately gauge their experiment's impact, so Mr. Swartz declined to offer predictions on similar future releases. "The jury is still out," he cautiously notes.

But Batteries Included can afford to be gracious and daring. They deal primarily in productivity programs—the kind that often arrive with fairly extensive documentation. Paradoxically, although hackers will patiently wait while a 1541 laboriously decodes and copies a disk, they balk at photocopying the manual.

At times, even without documentation, you can still use a program by asking judicious questions on the customer support hotline. But unless you are the registered owner duly listed in the distributor's data base, you probably won't get your questions answered.

While all this makes a great argument for unprotecting productivity software, what about games? There, very often, customer support is usually limited to warranty replacements only. And the minimal instructions are almost common knowledge, certainly for the more popular packages.

"Game publishers," says Mr. Swartz knowingly, "are taking a beating."

Barry Shatwell, formerly of Timeworks, and Vic Schiller a company VP, agree. And Shatwell adds, "Users who pirate software are the ones not likely to have bought it in the first place. But for free, they can't resist the temptation to add another game to their library."

For these reasons, Spinnaker Software, a long established publisher of entertaining educational software, protects all their releases. Ted Treadwell, Spinnaker's quality assurance manager, feels that doing otherwise would result in significantly fewer sales and innumerable illegal copies. Furthermore, he sees no alternatives on the horizon. Dongles and duplicate master disks disproportionately increase the cost of software.

Disk Protection—*A Primer*

Most of the dozen or so copy protection schemes presently in use rely on forcing errors into the disk's read/write tracks. Okay, what does that mean?

Commodore's standard disk format divides each disk into 35 tracks, and each track contains from 17 to 21 sectors. Each sector begins with a header that contains sync marks, disk ID's, track and sector identification, and a checksum. No two headers are exactly alike.

By deliberately introducing ID, sync, or checksum errors into certain tracks, the program tends,to abort during a load.

But why then doesn't the protected program crash? Because the program *first* recodes the 1541's random access memory to accept these errors and not report them to the 64's command channel. An error is only an error if the 1541's microprocessor says it is.

These programs are uncopiable since a standard copy operation does not include a reprogramming of the 1541's RAM, redefining just what is or isn't an error. And the 1541 dutifully refuses to copy an error unless it receives prior instructions to do so.

Now, enter the copy program. This seeks and identifies the errors (type and location), reassures the 64 that's all well—even though these errors are present—and to carry on with the task. But disk-track errors are yesterday's news. Far more sophisticated methods have been recently introduced. Let's look at two of them.

The first records data on a "non-existent" track 36. Since Commodore's disk operating system routinely reads only to track 35, anything past that is ignored—unless the RAM is first reprogrammed to read beyond.

The second method is the only one presently uncopiable. This extremely sophisticated system relies on density-bit changes.

Here, briefly, is the way it works. Data is recorded onto a disk in a certain standard way or, restated, in bytes per inch. The 1541 expects to see a certain density in a certain sector. By deliberately varying the density within a sector, an error condition is generated.

But why is this method so effective? Because, unlike the disk errors, density changes are variable. The publisher decides on the degree of deviation. It's a combination lock that only the publisher can open. So far.

Steve Schwebel, Micro-W's resident code cracker, is developing an artificial intelligence routine to identify, locate, and analyze density bit changes. But, at least for the moment, publishers still hold the upper hand in the continuing cat and mouse game of copy protection.

Two Alternatives

In attempting to still user complaints, the industry has tried two alternative protection methods: dongles and dual master disks. While they solve some problems, they create others, and so far neither has been used extensively.

Dongles are electronic "keys," usually inserted in a joystick port. Dongles are really an encrypted ROM chip containing instructions the program requires to load and run. Once the dongle's in place, you can make as many backups as you need because it's the dongle, not the software, that's protected.

As with all things, there are disadvantages here too. Most evident is the $5.00 to $10.00 additional cost. For software retailing near the $30.00 mark, that additional cost is disproportionate. And what happens if you lose your key? Well, you can still get a replacement, but it may be expensive—as much as $35.00.

Another attempted solution is dual master disks. Supplied with two originals, you have an immediate backup should one fail. Furthermore, if one is damaged, you can return it for replacement while using the other. Of course, there are unscrupulous users who view the second master merely as a convenient pre-made copy.

There remains yet a third alternative, one based on mutual trust. For serious users who cannot afford to be down, some publishers will send a duplicate master upon payment of a nominal handling fee (usually $5.00). Write to your program's publisher explaining your special circumstances.

Reading the Fine Print

Spinnaker occasionally, like all other publishers I spoke with, prosecutes licensing violations when adequately provoked. So just what constitutes a violation? For instance, are multi-user systems in schools illegal?

"Definitely not," says Batteries Included's Swartz. "As long as the disk isn't copied, it's legal." In fact, they encourage group use, wisely viewing it as an investment. "After all," he continues, "users tend to buy software they know and are satisfied with."

A similar perspective was voiced by Timeworks. They, in fact, are showing their active support of educational networking by introducing School Paks, a marketing promotion highlighting specially priced packages for volume buyers.

> "*Users who pirate software are the ones not likely to have bought it in the first place. But for free, they can't resist the temptation.*"

Vic Schiller of Timeworks: Game publishers are taking a beating.

But Bill Rosen of Simon & Schuster casts a cool light on multi-user systems. Says Rosen, "That's definitely a violation of our present licensing agreement." He adds though, that Simon & Schuster (as well as Prentice-Hall) is considering revising their policies and will likely offer site licensing agreements shortly. Other publishers of educational software, however, remain firm in their opposition to networking.

In a sense then, using software in a multi-user system may not seem much different from borrowing a book or record from your library. But since it's the publisher that determines the limitations of the license (you either accept it or you don't), I'd recommend that you read the agreement or check with the program's publisher *before* purchasing the software.

To Market, To Market

Retailers have as much at stake as do publishers, since rampant duplication also deprives them of income. And their perspective on copy protection, not surprisingly, closely parallels the publishers'.

Let's return, for a moment, to our utopian marketplace, and consider the pandemonium if all copy protection were magically removed from disks. When I asked this question of several software dealers, their almost unanimous response was best stated by Bob Signer, owner of the White Plains, New York, Software Link.

> *Removing copy protection across the board would be like offering free candy: users would copy everything in sight. But then, the market would stabilize.*

Retailer Bob Signer: Piracy would eventually diminish if software prices came down.

He predicted that the immediate result would be like free candy: countless users would copy practically everything in sight. But then as the novelty wore off, the market would stabilize. Eventually lower prices would allow more users to purchase more programs for their dollars. Piracy, while it would never completely disappear, would diminish significantly.

Some retailers feel that most pirating is done by younger users to whom $30.00 or so is considerably dearer than to the more affluent adults. True, but that's only one of several explanations.

The three reasons cited most often are cost avoidance, dissatisfaction with earlier purchases, and elimination of possible damage some disk protection schemes inflict on certain expensive disk drives. (All that chattering you hear when loading certain programs is the drive's read/write head frantically rechecking errors or searching for non-existent tracks.)

Micro-W, the company famous for its Clone Machine copy program, readily admits it is scorned by other software publishers.

Micro-W's Lou Ploch: "No one scorns Xerox or makers of video cassette recorders, and they exist primarily to make copies."

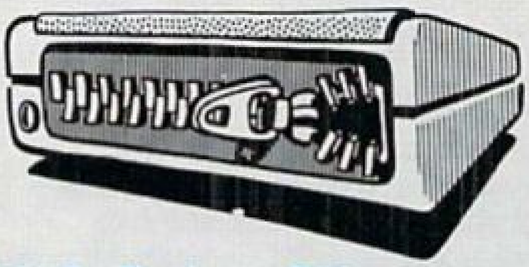
Stick and Stones

Lou Ploch, the much maligned president of Micro-W, the Butler, New Jersey, firm famous for its *Clone Machine* copy program, readily admits that his firm is scorned by other software publishers.

For all the many insults, Lou and Micro-W have withstood, he insists they are simply providing a needed, perfectly legitimate service. "Sure," he observes, "you can always obtain replacement disks from the vendor for a small fee, but what happens when the vendor is bankrupt or has disappeared, then what do you do?"

He sees his product as the electronic equivalent of a photocopy machine. Says Ploch, "No one scorns Xerox, or the makers of video cassette recorders, and they exist primarily to make copies."

He feels the greatest threat to software publishers is not the occasional copier, who usually makes just one or two copies for archiving or exchanging with friends, but the wholesale bootlegger. He emphasizes that *Clone Machine*, or for that matter any commercial copy program, just isn't suitable for that kind of use—it simply takes too long to make dozens or hundreds of copies.



Disk Drive Silencer

Some heavily protected software raises considerable havoc with disk drives. To minimize all the grinding and chattering, type in this short BASIC program:

```
10 OPEN 15,8,15
20 PRINT #15,"M-W";CHR$(106)
   CHR$(0)CHR$(1)CHR$(133)
30 CLOSE 15
   RUN
```

When the READY prompt appears, load your disk according to the program's instructions. Most, if not all, of the head's forced repositioning will be eliminated. ◼

Paradoxically, Micro-W also publishes "legitimate" software and it is copy protected. I asked Ploch if he wasn't being a hypocrite. He replied that most of the software is just published, not written, by Micro-W, and it is the authors' wishes that the software be protected, not his.

Microtechnic Solutions found their unprotected telecommunications program posted on a West Coast electronic bulletin board.

Joe O'Hara, Microtechnic Solutions' president: Caught in the crossfire.

Try and Try Again

Microtechnic Solutions' president, Joe O'Hara, is a man caught in a crossfire. He, like numerous small publishers, is being pulled in two directions at once.

He remains calm while recalling the frustrations and disappointment he felt after finding his unprotected telecommunications programs posted on a West Coast electronic bulletin board. After he took legal action to have them removed, his later releases were copy protected.

That, in turn, led to customers complaining they were being unfairly penalized for the actions of an inconsiderate few. They wanted backup capability, and they objected to waiting for replacement disks when the original was accidentally damaged. Businesses were especially irritated by restrictive copy protection schemes.

Facing lost sales in a condemned whether-you-do-or-you-don't scenario, Microtechnic Solutions has again reversed its policy, and its latest releases, *Smart Terminal 64* and *Sixth Sense*, are unprotected.

Today, tired from racing to keep ahead of the cloning programs, and responding to increasing pressure from users, Microtechnic Solutions prefers to concentrate on research and development efforts to improve their product. And even resigning themselves to some inevitable losses, they've charted a tentative course of consumer trust.

O'Hara's reasoning is simple: "Disk copy programs," he says, "are abundant, cheap, and sophisticated. Those users who will copy a program will likely do it whether or not it's protected."

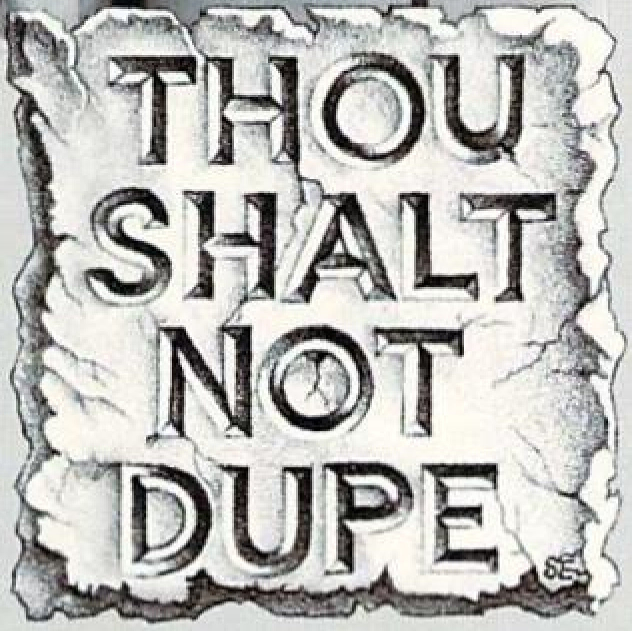
And so it goes. Each faction in the fracas—publishers, users, hacker, and pirate—sees the issue from their own perspective.

Will these issues ever be reconciled and resolved? While I hope so, I also doubt it. For the foreseeable future, we're all fixed players in an endless game of hide and seek. ◼

ADAPSO Brief

by Cheryl Peterson

David Sturtevant of ADAPSO.



ADAPSO, the Association of Data Processing Service Organizations, has started a campaign to cut down on software piracy among business users. A four-point plan developed by the group would curtail theft by educating the public about the issue, by sponsoring legislation to help protect the interests of software vendors, by helping software companies in lawsuits against copyright infringers and license-agreement violators, and by standardizing a hardware method of software protection.

As part of their educational program, ADAPSO is seeking member corporations who will distribute pamphlets (supplied by ADAPSO) to their employees who use computers. These pamphlets, entitled "Thou Shalt Not Dupe," define piracy and outline a company policy opposed to copying or illegally using software. A policy statement in the back of the pamphlet serves as both a guide and warning to employees, emphasizing that violations of U.S. copyright law can result in civil fines of $50,000 or more and can lead to imprisonment if criminal charges are upheld.

ADAPSO's members are also lobbying for stronger protection of software via the copyright laws and through stricter enforcement of licensing agreements. As it stands now, in-package licensing agreements are understood by the software companies to have the same validity as any other contract signed by two parties. These "shrink-wrap licenses" usually state that upon receiving and opening a software package, the purchaser becomes bound by the terms of the license. Such licenses, however, have not been adequately validated in a court of law. This is partially because copyright infringement suits are seldom brought in the software business. When cases are filed, the offending company will generally settle out of court. Several state legislatures are considering laws to help protect software vendors and ADAPSO members are lobbying to help this effort.

In relation to this, ADAPSO has joined with MicroPro International Corporation in bringing a lawsuit against Wilson Jones Company and its parent company American Brands, Inc., for copyright and trademark infringements. Wilson Jones allegedly copied and distributed bootleg copies of *WordStar*, *MailMerge* and *SpellStar* among its employees and to others outside the company. In asking for damages from a Fortune 100 company, ADAPSO hopes to focus media attention on the problem. Similar lawsuits against other companies are being considered, as well.

As a final measure in protecting the rights of software vendors and authors, ADAPSO is sponsoring conferences to standardize a hardware key system that will make illegal copies of software unusable. By attaching a key ring to an RS-232 port (commonly found on most microcomputers), it's possible to create a software/hardware combination that won't work without a proper key inserted into the key ring. The vendor markets the key, the software, documentation and support as a package.

There are several steps to be taken and a few hurdles to be overcome before such a Software Authorization System can be implemented. A standard must be developed, so that one software company's software and key won't interfere with another's. By careful planning in the early stages, the system can be set up so that many different software packages can be run simultaneously, the software can be run from any drive within a computer system and will function properly when run on a multi-user system.

David Sturtevant, senior director of Public Communications for ADAPSO, explained the organization's goals: "Our purpose is to bring the vendors and users together to create a system where good software can flourish and the users will continue to get good products at reasonable prices. We don't want to inconvenience users unnecessarily, but we don't want software companies going bankrupt because of stolen inventory."

"A similar situation threatened the retail industry a few years back. Shoplifting was eating into profits so badly that some companies feared for their financial life. Now shoppers are used to seeing locks on display cases, plastic tags that must be removed before clothes can be taken from a store, even fur coats chained to the racks. There's a small amount of inconvenience for the buyer; a large inconvenience for the thief."

For more information on ADAPSO, the software piracy problem, the Software Authorization System, or to obtain copies of "Thou Shalt Not Dupe," contact

ADAPSO
Suite 300, 1300 North 17th Street
Arlington, VA 22209
or phone: (703)522-5055

A BUYER'S GUIDE TO MODEMS AND TERMINAL SOFTWARE

BY TOM BENFORD

The ability of a computer to transmit data to and receive data from other computers is dependent on two factors—one is hardware, the other is software.

Modems take care of the hardware end—the actual physical linking of the computer to a telephone line. Here, we cover what a modem is, what it does, and what features are desirable to have in a modem. Five of the most popular Commodore-compatible modems are also reviewed, and a comparison chart of their features is included.

Terminal programs provide the necessary settings and controls to activate the otherwise dead modem. The terminal software section of this article explains what is necessary to accomplish this, discusses user-friendliness, and lists desirable convenience features. Ten of the most popular (and unique) terminal programs are reviewed, and a feature-comparison chart is also included.

While all the modems covered here come with some sort of terminal software, it is often desirable to purchase a separate terminal program to get the most from your modem. Also, some of the software discussed here offers other features, such as word processing, in addition to communications capability.

Regardless of which modem/terminal package you decide upon, you'll find that there's a whole new world of computing out there waiting for you—one that's sure to provide you with many hours of fun and enrichment. Enjoy it—it's only a phone call away!

MODEMS

A modem is a device that takes data signals from your computer and modulates them into a form that can be transmitted to other computers over ordinary telephone lines. Likewise, the modem can also receive data from other computers and demodulate it. Since the modem can MOdulate and DEModulate data signals, the name modem evolved.

Using a modem allows your computer to *telecommunicate* with other computers. This practice is also called *telecomputing*—the terms can be used interchangeably. The important thing to remember is that the modem provides the hardware link necessary to access other computers. It acts as a "passport" into a new universe that's chock full of information.

In this new universe, you'll be able to access information from data bases, get the latest stock prices, check airline schedules, send and receive electronic mail (E-mail), make purchases from merchants offering "shop-by-computer" services, do your banking, or go to school. If you're an "electronic cottager," then you can even go to work via a modem!

Telecomputing also allows you to exchange ideas, information, and programs with other computer users *through* the computer itself. You can access bulletin board systems (BBS's) and post or read messages, buy or sell items through the "electronic classifieds," or "chat" with the SYSOP (systems operator). Local user groups frequently operate free BBS's, and these are not only fun but also a great source of computing information for the novice. Often they're also a source for getting the phone numbers of other bulletin boards around the country.

In addition to making the entire world accessible by computer, modems have also served to make computing a *social* event similar in some ways to CB or ham radio. There are all kinds of bulletin board systems out there offering all kinds of activities and services—games, information downloading, program exchanging, even dating or match-making services to help you meet people of similar interests.

But *modems* are what make it all possible. Modems have changed computing from a solitary activity to an interactive one. Some experts in the field of telecommunications have called modems the most significant advance in communications since the invention of the printing press.

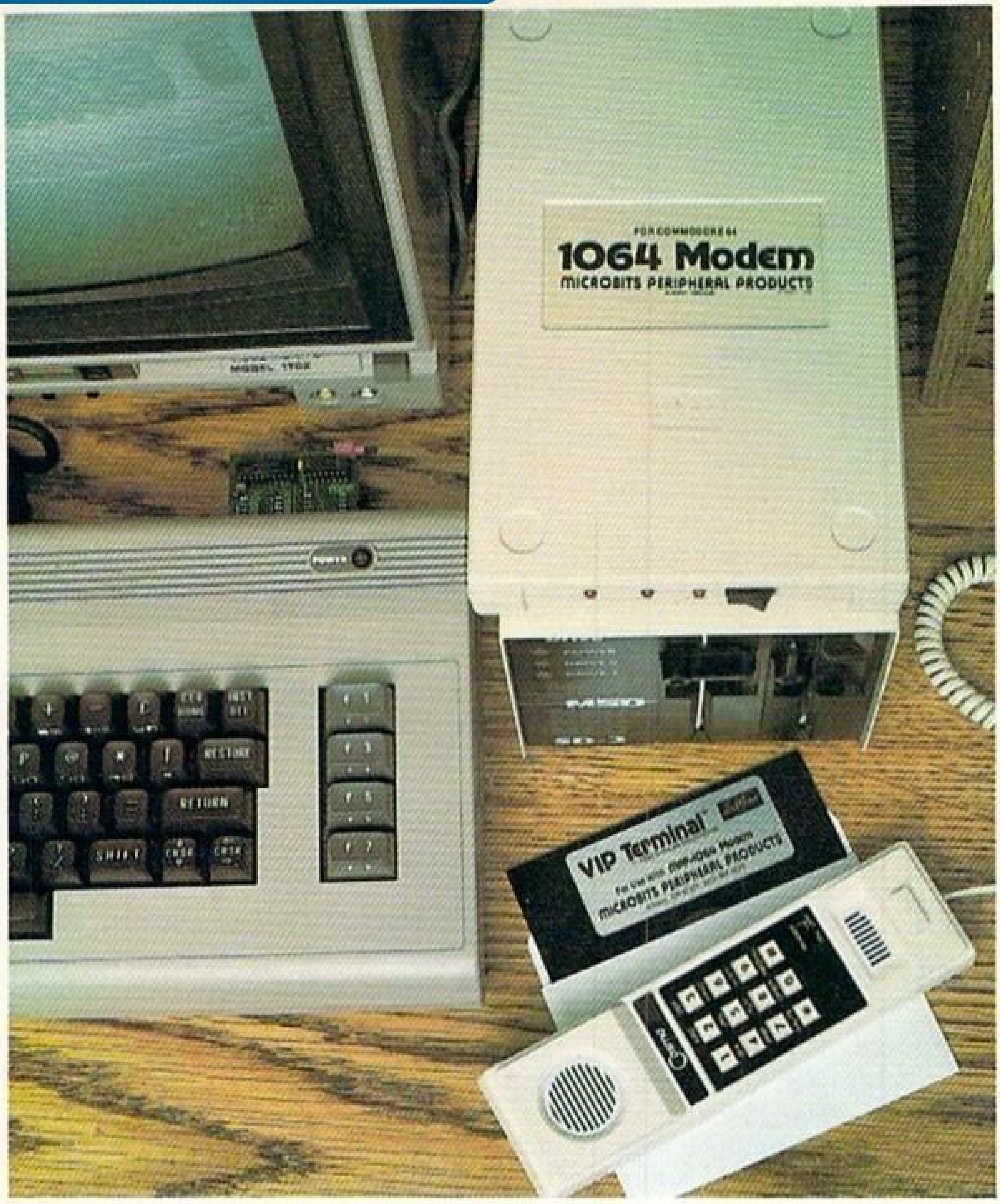
Choosing a modem for your computer isn't easy. There are many available, and their prices vary according to their features. Some features are highly desirable, and you should look for them when shopping for a modem, since they'll make your telecomputing more enjoyable and efficient. Let's take a look at these features.

MODEM TYPES

Modems are available in two general types: acoustic or direct-connect. Acoustic modems were the first type available, and they are still widely used for some applications in the business world. While direct-connect modems are much more popular with home computerists, acoustic modems are still being used for some home applications.

The acoustic modems have a "cradle" with rubber cups on each end. The telephone handset is placed into this cradle after a connection has been established, and data signals are transmitted and received through the telephone handset. These modems are called acoustic because they rely on sound going into and coming out of the telephone handset. They're particularly susceptible to noise, both in the room and on the telephone lines, so they aren't too reliable for home telecomputing. Businesses often use isolated data-transmission phone lines and acoustic enclosures for their acoustic modems.

Direct-connect modems are the clear favorite for home computing since they're relatively inexpensive and very reliable. As the name indicates, the modem is directly connected to the phone line without involving use of the telephone handset. Some direct-connect modems require that you unplug the wire from the phone and plug it into the modem when you wish to telecommunicate. Others allow both the phone and the modem to be connected to the phone line; these provide a switch that lets you either talk or telecommunicate data. Because this feature allows both the phone and modem to be connected without your having to plug and unplug cables, it is a highly desirable one.



Some experts in the field of telecommunications have called modems the most significant advance in communications since the invention of the printing press.

THE COMPUTER CONNECTION

How the modem connects to the computer should be another purchasing consideration. Plug-in modems simply plug into the user port of the VIC, Commodore 64, SX-64 or Plus/4.

RS-232 modems require the use of a Commodore 1011-A or other RS-232 interface. RS-232 modems are usually more expensive than the plug-in variety, and you'll also have to purchase an RS-232 interface to use them. RS-232 modems are "generic"—they will work with just about any computer, provided an RS-232 port or interface is available, and they usually have high-speed data-exchange rates (baud rates). Since there is such a large variety of RS-232 modems and they require additional interfaces, we'll devote our attention to the simpler and more popular Commodore-dedicated plug-in variety.

USEFUL FEATURES

Here are several useful features that will facilitate your telecomputing. While they are not *absolutely* necessary, they do make telecomputing easier and usually don't add significantly to the price.

A *voice/data switch* allows you to select either a "talk" mode for normal phone conversations or a "data" mode for telecomputing. This switch eliminates cable swapping between the phone and modem.

commodore
modem/300

Your wallet is the deciding factor on how much you want to spend, and having a clear idea of what you intend to do with the modem will help you find the best model in your price range.

An *originate/answer switch* permits you to select whether you wish to call another computer (originate), or have your computer answer calls coming in from other computers (answer). Modems emit a tone called a "carrier" signal when in the answer mode, but in the originate mode they remain quiet until they detect a carrier. This switch provides easy selection of calling or answering capabilities.

A *full/half duplex switch* allows you to match the requirements of the computer at the other end of the phone. Some computer systems receive information, copy it immediately and send it back to you (sort of an "electronic echo") to confirm that your information was received. This is called a full duplex system. If the other computer is not set up to echo your signals, you use half duplex mode. This mode echoes itself to the screen so you can see what you're sending over the modem. Otherwise, you would not be able to see what you're typing. Having a switch to select either full or half duplex mode is a very helpful feature to have.

Indicator lights are useful for monitoring the operation of the modem. An indicator light to confirm that the established phone connection is stable is a desirable feature. Some modems have more than one light to indicate various modes such as voice/data or originate/answer. These indicators keep you posted on the status of your modem, and, while not essential, they are nice to have.

PRICE

Modems are available in prices that range from under $50 to several hundred dollars depending on their features and manufacturer. Your wallet is the deciding factor on how much you want to spend, and having a clear idea of what you intend to do with the modem will help you find the best model in your price range.

If you won't be doing much telecomputing (less than one hour a month), you probably won't mind the minor inconvenience of unplugging the telephone to connect the modem. For such light-duty use, you can skip some of the fancier features and shop for low price. Bear in mind, however, that you *may* increase your telecomputing activities in the future, and you'll miss these desirable convenience features as your modem use increases.

If you intend to be spending a reasonable amount of time on-line, you'll want a modem that provides you with all or most of the desirable features I've outlined above. Having these extra features doesn't hurt, and often the difference in price between a bare-bones modem and one that provides you with some (or all) of these conveniences is only a few dollars.

Regardless of how spartan or full-featured your modem choice is, shop around and compare prices. High-volume distributors, mail-order magazine ads, and discount chains are often good places to start on your modem bargain hunt.

Let's look at five of the most popular modems that will work with the VIC, Commodore 64 and Plus/4. All of them, with the exception of the 1650 AutoModem, will work with the SX-64 as well (the SX-64 power cord gets in the way of the 1650.) The five modems reviewed here have undergone actual hands-on testing, and they re-

Table 1. Modem Comparison

Modem	Manufacturer	Address	Supporting Software	Connection	Indicator Light	Suggested Price	Special Features	Baud Rate
Mitey Mo	Computer Devices International	1345 Doolittle Dr. San Leandro, CA 94577	Disk and Tape	Plug-in	No	$119.95		300
MPP-1064	Microbits Peripheral Products	3615 Pacific Blvd, SW Albany, OR 97321	Disk	Cable	Yes (3)	$99.95	Separate power supply	300
Auto-Print Microconnection	Microperipheral Corporation	2565 152nd Ave NE Redmond, WA 98052	Disk	Cable	Yes (3)	$149.95 cable	Direct printer	300
1650 Auto Modem	Commodore Business Machines	1200 Wilson Dr. West Chester, PA 19380	Tape	Plug-in	Yes (1)	$69.95		300
Modem/300	Commodore Business Machines	1200 Wilson Dr. West Chester, PA 19380	Disk	Plug-in	No	$119.95	Built-in speaker	300

present good values in performance, reliability, and price.

MITEY MO

The *Mitey Mo* is a compact unit from Computer Devices International that plugs into the user port of the computer. It has a voice/data switch for selecting modes, and it permits the phone and modem to be connected at all times. This modem doesn't have indicator lights, duplex mode selection, or answer/originate switches, but it's a solid unit that performs well. It is supplied with terminal software on both tape and disk.

MPP-1064

The *1064 Modem* from Microbits Peripheral Products is a full-featured modem allowing the phone to be connected with the modem at all times. It has automatic answer capabilities, which make it ideal for use as the "host" of a bulletin board system.

Three indicator lights on the 1064 alert the user to the modem's status: on/off (off allows a human to answer the phone), off hook (indicates the modem has answered a call), and carrier detect (indicates that the 1064 has successfully linked with another modem and it is ready for communication). The 1064 connects to the user port through a cable, and its large size allows the phone to sit on top of the modem. It comes with its own transformer for power, the only one covered here which requires a separate power source. *VIP* terminal software is supplied on disk with the 1064.

AUTO-PRINT MICRO-CONNECTION

The *Auto-Print Microconnection* from the Microperipheral Corporation is a rugged unit that connects via a cable to the user port. Three indicator lights are provided to inform you of the modem's status. The modem also has originate/answer and data/voice switches in addition to a "handshake" switch for establishing communication between modems.

One drawback is that the telephone handset must be unplugged to connect the Auto-Print. This is somewhat of an inconvenience if you do a fair amount of telecomputing. On the plus side, however, is the inclusion of a parallel printer cable which connects the modem directly to a line printer. This provides a fast means of dumping data directly to the printer as it comes in over the modem. Disk-based terminal software is supplied with the Auto-Print.

COMMODORE 1650 AUTOMODEM

The 1650 produced by Commodore has been a long-time favorite with Commodore users because it combines some very desirable features with a reasonable price. It allows the telephone to stay connected at all times, it has a voice/data selector switch, an answer/originate switch, and a full/half duplex selector switch. A red LED indicates when a connection has been established, and the modem has auto-dial/auto-answer capabilities as well. Though it has been upgraded to the *Modem/300* (Model 1660) in Commodore's product line, many dealers and stores still have the *1650 AutoModem* in stock. It's a very reliable unit with a good assortment of features.

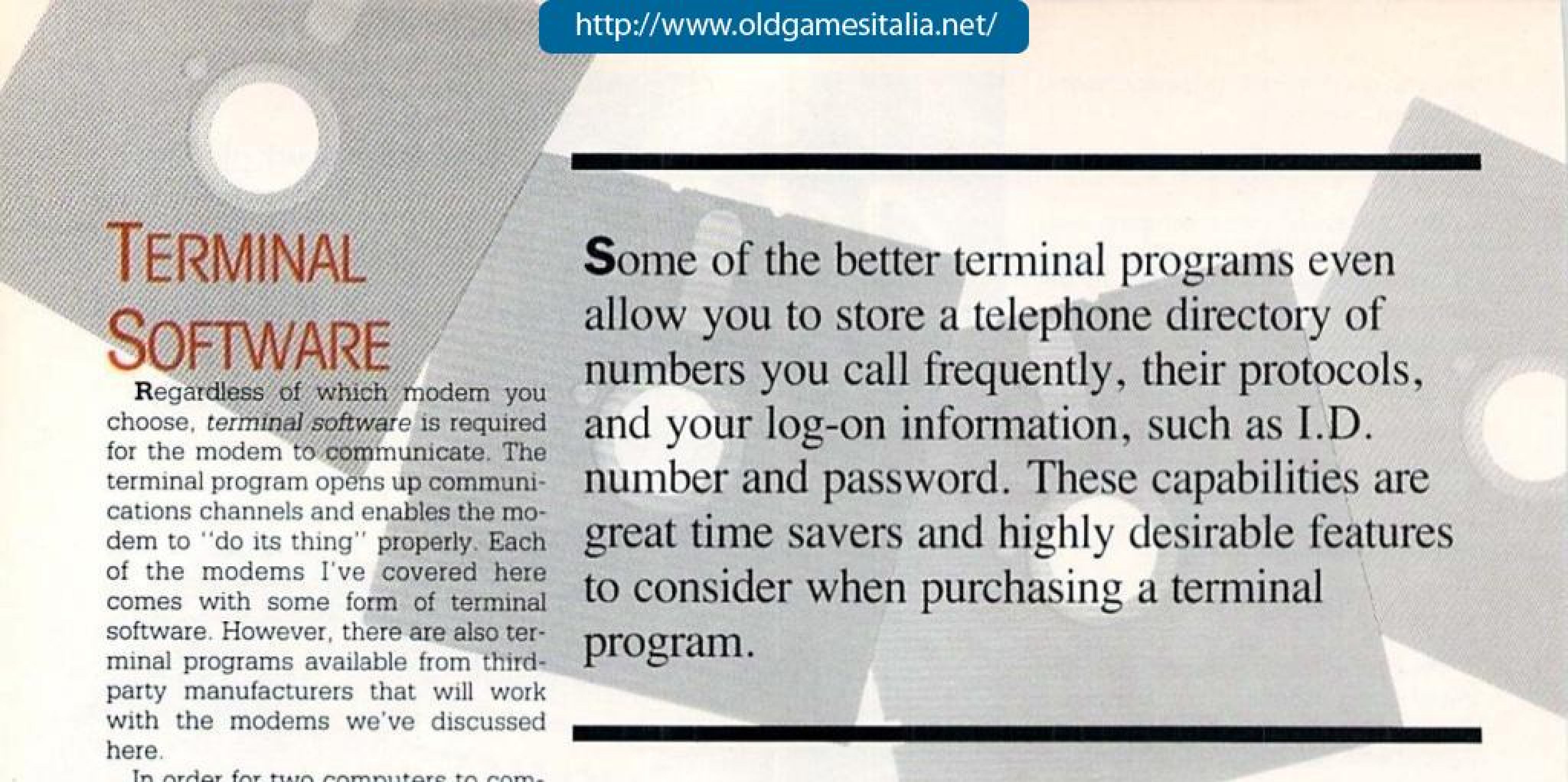
COMMODORE MODEM/300

The *Modem/300* (Model 1660) is an auto-dial/auto-answer modem that has voice/data selection and full/half duplex selection built into its terminal software. Unlike many other modems, you can use the Modem/300 with both Touch Tone and rotary telephones. A switch is provided to select answer or originate modes. This compact unit also works with the SX-64 computer in addition to the VIC, 64 and Plus/4. A unique feature of the Modem/300 is its *built-in speaker* which allows you to audibly monitor its automatic dialing functions. It comes with HiggyTerm terminal software on disk, which allows you to upload and download text files, and, like its older brother (the 1650), it's very reliable.

Table 1 is provided to supply you with the "facts at a glance," so you can compare the various features of these five modems more easily.

There's a whole new world of computing out there waiting for you— one that's sure to provide you with many hours of fun and enrichment.

VOICE
DATA
LINE
PHONE
Mitey Mo
USI
commodore
AUTOMODEM



TERMINAL SOFTWARE

Regardless of which modem you choose, *terminal software* is required for the modem to communicate. The terminal program opens up communications channels and enables the modem to "do its thing" properly. Each of the modems I've covered here comes with some form of terminal software. However, there are also terminal programs available from third-party manufacturers that will work with the modems we've discussed here.

> **S**ome of the better terminal programs even allow you to store a telephone directory of numbers you call frequently, their protocols, and your log-on information, such as I.D. number and password. These capabilities are great time savers and highly desirable features to consider when purchasing a terminal program.

In order for two computers to communicate with each other, they must be sending and receiving data in a form that is mutually understandable to both. A standard code for transmitting and receiving data has been established called ASCII (American Standard Code for Information Interchange). Commodore computers use a variation of ASCII known as PETSCII. Converting PETSCII to ASCII for transmitting data and reversing the conversion for receiving it constitutes one of the many jobs a terminal program for Commodore computers must perform.

In addition to the PETSCII-ASCII conversions, the terminal program must also open up data channels to the user port, printer, and disk or cassette ports. It also has to take care of details like setting up the data transmission protocols. These are parameters that govern how many bits per second (called the baud rate) are transmitted or received and how many bits are used in the data signal (7 or 8), insert line feed signals if necessary, format the screen so the information you receive will be readable in 40 columns without breaking words at awkward places, and a host of other chores. The terminal program has to take care of all this, and that's only the beginning.

The ability to transmit text, data or program files from disk or cassette is called uploading, and receiving such files and storing them is known as downloading. Uploading and downloading require special routines written into the terminal software.

Capturing and storing received data in "buffer" memory is another task handled by the terminal software. Some means of capturing and storing information is highly desirable in a terminal program, since it allows you to keep your on-line costs to a minimum. Once the information is stored to disk or cassette, you can read it over at your leisure.

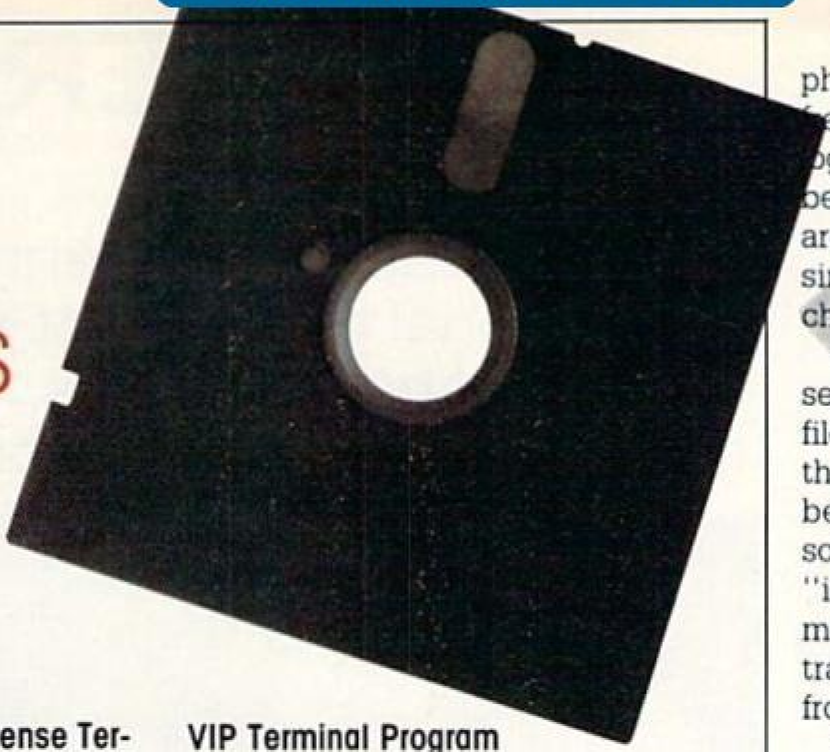
Some facility for sending data directly to the printer either from the screen, buffer memory or disk should also be included in the program. Look for such a feature as well, since it enhances the usefulness of the terminal software.

A good terminal program ideally will handle all of these tasks and allow for altering protocol parameters. Protocol parameters are signal settings for the transmission and reception of data between different computers. Not all computers use the same protocols, so the ability to alter the default parameter settings enables you to conform to different computers at the other end of the phone. The better terminal programs store this protocol information for future use, along with the phone number of the computer it pertains to. This is a very handy feature since it eliminates the need to manually enter it each time you call that computer system.

Table 2. Terminal Software Comparison

Program Name	Publisher	Medium	Change Params.	Saves Changes	Alarm	Clock/ Timer	Disk/Prntr Dumps	Upload/ Dwnload	Special Features
Smart 64 Terminal	Microtechnic S.	Disk	Yes	Yes	Yes	Yes	Both	Yes	Transfers Program Files
Sixth Sense	Microtechnic S.	Disk	Yes	Yes	Yes	Yes	Both	Yes	Micro Commands
VIP Terminal	Softlaw Inc.	Disk	Yes	Yes	Yes	Yes	Both	Yes	Icons, Help Screens
Superterm	Midwest Micro	Disk	Yes	Yes	Yes	Yes	Both	Yes	Smart Cart. & Cable
Telstar 64	Eastern House	Cart.	Yes	Yes	Yes	Yes	Both	Yes	Dir. Prgm. Downloads
'64 Terminal	Midwest Micro	Disk	Yes	Yes	No	No	Prntr	No	None
Higgyterm	Commodore	Disk	Yes	Yes	No	Yes	Both	Yes	40,597 Char. Buffer Upload/Download Programs
Busiterm	Skyles	Cart.	Yes	Yes	No	Yes	Both	Yes	Dir. Prgm. Downloads
Homepak	Batteries Included	Disk	Yes	Yes	No	Yes	Both	Yes	Word Proc./Database
Skiwriter II	Prentice-Hall	Cart.	Yes	No	No	Yes	Both	Yes	Word Processor Prgm.

TERMINAL SOFTWARE PUBLISHERS



Smart 64 Terminal & Sixth Sense Terminal Programs
Microtechnic Solutions
P.O. Box 2940
New Haven, CT 06515

'64 Terminal & Superterm Terminal Programs
Midwest Micro, Inc.
311 West 72nd Street
Kansas City, MO 64114

Homepak Terminal, Word Processing & Database Program
Batteries Included
30 Mural Street
Richmond Hill, Ontario, Canada
L4B 1B5

Telstar 64 Terminal Program
Eastern House Software
3239 Linda Drive
Winston-Salem, NC 27106

VIP Terminal Program
Softlaw, Inc.
9072 Lyndale Avenue South
Minneapolis, MN 55420

BusiTerm Terminal Program
Skyles Electric Works
231E South Whisman Road
Mountain View, CA 94041

SkiWriter II Wordprocessor/Terminal Program
Prentice-Hall
P.O. Box 819
Englewood Cliffs, NJ 07632

HiggyTerm Terminal Program
Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380

A terminal program should be fairly easy to use. Menus or command summary screens are helpful, as are keyboard templates or overlays. *Cheatsheet Products* offers templates for four popular terminal programs: *VidTex, Term64, VIP Terminal* and the *Smart Terminal*. They're available from Cheatsheet Products, P.O. Box 111368, Pittsburgh, PA 15238, (412) 781-1551 for $3.95 each.

Good documentation that clearly explains the features and operations of the program is always a feature to consider. Some programs have the documentation on disk, while others supply a manual with the software. In either form, it should be clear and easy to understand.

Going on-line can get to be expensive, so having some means of keeping track of the time is another helpful feature of a terminal program. The better ones have a clock which displays the elapsed time since going on-line. The best terminal programs provide you with an audible alarm to inform you when a predetermined time has been reached. Any clock or timer is better than none, and an alarm timer is best.

Many modems will support automatic dialing if the software has this feature. While auto-dialing is good, auto-dialing with automatic re-dialing is even better, since it will keep trying a busy BBS number at regular intervals until it establishes a connection. It sure beats dialing the same number manually over and over again, so this is a really good feature to have.

Some of the better terminal programs even allow you to store a telephone directory of numbers you call frequently, their protocols, and your log-on information, such as I.D. number and password. These capabilities are great time savers and highly desirable features to consider when purchasing a terminal program.

Most good terminal programs can send or receive text files. Program files are another matter, though, since they require special handling. The better terminal programs provide some means to convert program (or "image") files into text files for transmission or reception, and a way to translate them back into program files from the text form.

Some of the better terminal programs have *macro command* capabilities, which allow a predetermined set of instructions to be executed. Macro commands can handle telecommunications in an unattended mode, post messages for other callers to read, do conversions or translations to downloaded programs automatically, and so forth. They are very handy to have, especially if you're into program swapping via the modem.

You'll probably want to save certain portions of received data while disregarding the rest (log-on greetings, for instance). Some means of editing received data while still in buffer memory prior to saving or printing it is, therefore, a very useful feature. Editing facilities differ from program to program, but almost all of them offer it to some degree.

Terminal software comes on cassette, disk or cartridge. Cassette-based software is cheap, but it is very slow. Cartridges are convenient and load instantly, but they generally cost a bit more. Terminal software on disk is relatively fast and the prices vary depending on the number of features included.

Some programs offer extra "hardware goodies" as options. For example, *SuperTerm* offers a "smart ASCII" cartridge and cable which allows dumping information directly to a parallel printer as it streams in over the modem. Your needs and wallet will dictate whether such options are for you.

Table 2 compares ten popular terminal programs. These ten were selected because of their features, uniqueness, and reliable performance. Each represents a good value, and there's something for everyone covered in this table. ■

OPERATION:

by John E. Conway

Anyone can build an entertaining and educational turtle robot from toy store component parts. This one can be controlled by your Commodore 64.

Many of us dream of the day when personal robots will be as common as personal computers. Just imagine a computer-controlled machine that responds to "master's" every beck and call. Sound farfetched? Well, such a device may be closer than you think. In fact, it's so easy to construct a robot from toy store and hobby shop parts, you may wonder why you hadn't built one sooner. In all fairness, our "homebrew" robot does not wash dishes or windows. It can't even vacuum the rug or walk the dog. However, it does make an interesting electro-mechanical pet and playmate, and it might actually teach you a thing or two.

The robot selected for this article is of the turtle variety. Turtle robots trace their origin to the development of the LOGO language at the Massachusetts Institute of Technology. In LOGO, the cursor displayed on the video screen has the shape of a little triangle called a "turtle." In advanced versions of LOGO, a two-wheeled, hemispherical turtle robot is connected to the computer. The computer acts as the "brain" of the robot while the robot acts as a "real world" extension of the computer. Equipped with a computer-controlled pen, some turtles can also serve as a simple printer/plotter peripheral.

The turtle is a good first robot for a variety of reasons, chief of them being simplicity of design. As shown in Figure 1, the unique two-motor/two-wheeled drive provides both traction (forward and reverse motion) and steering (turning motion). This allows the little machine to turn in its own space—a necessity for graphics. Finally, the turtle is small and lightweight. Thus, it uses little energy. In fact, with intermittent operation, a turtle can run off of a set of penlight batteries for hours. All of these factors combine to make the turtle ideal for connecting to computers like the Commodore 64.

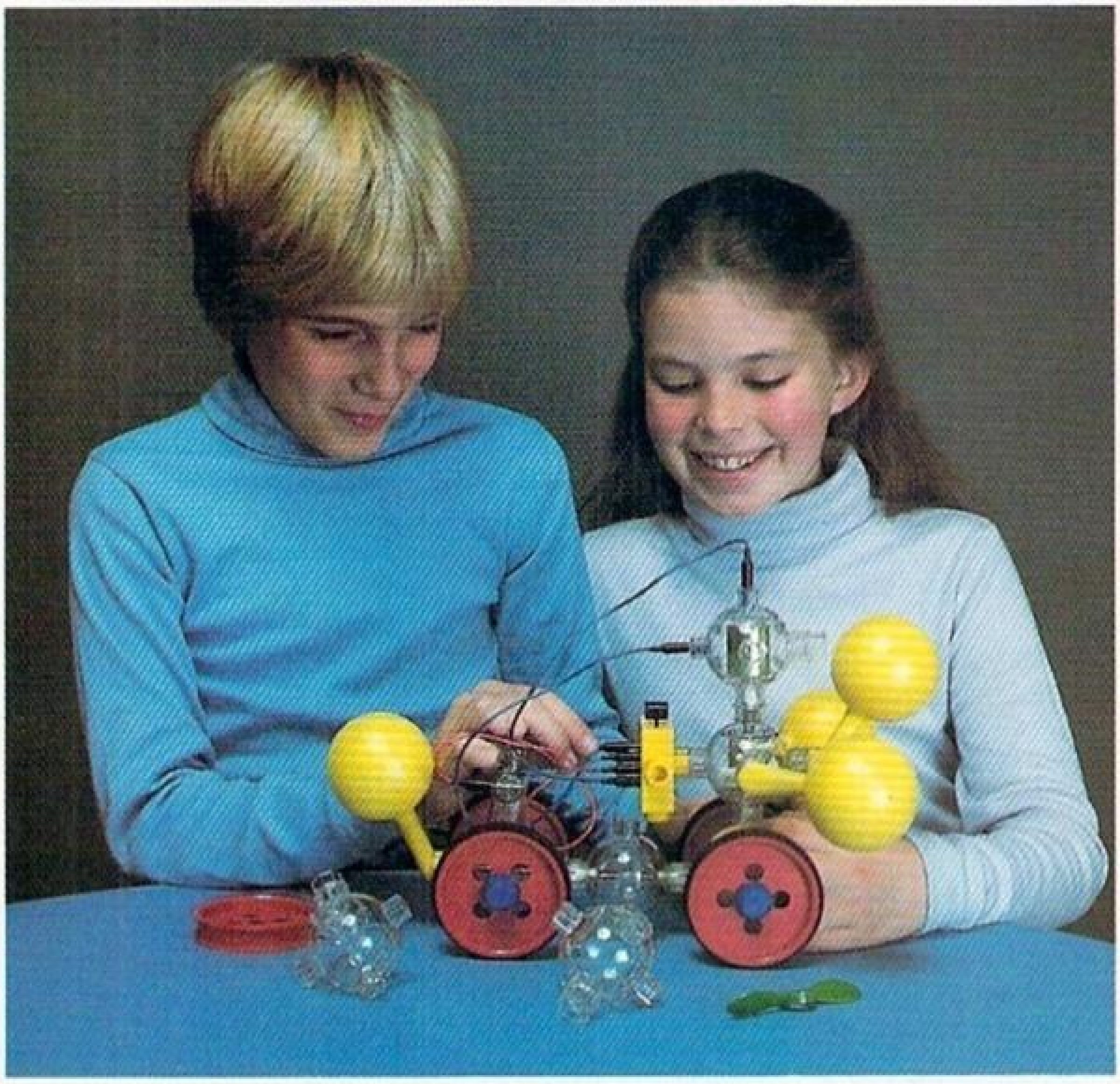
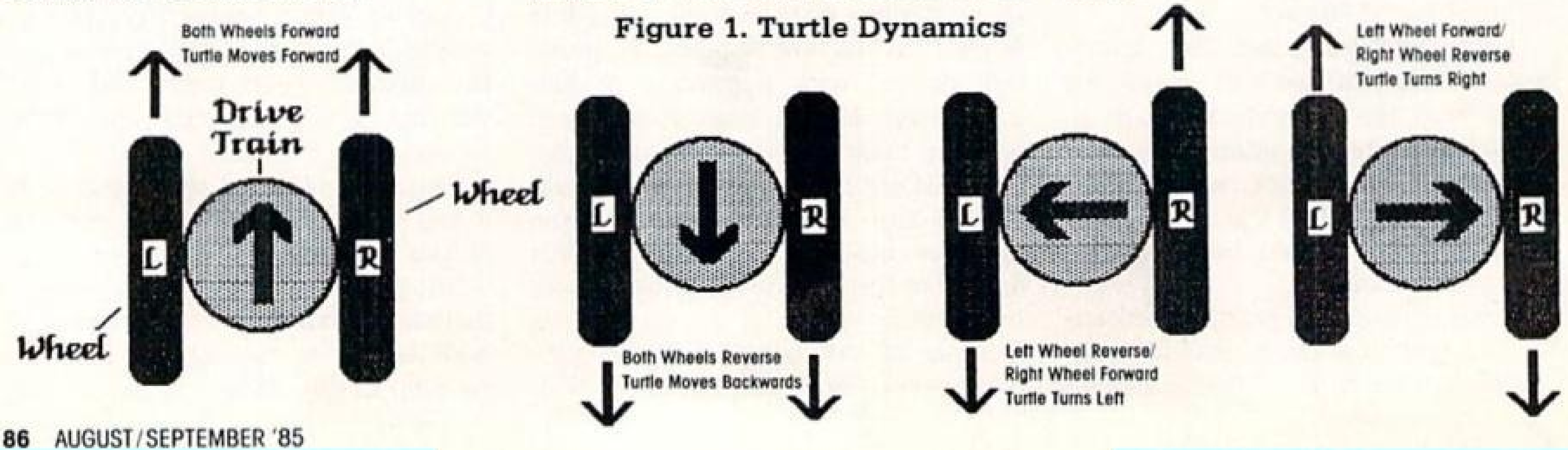


Figure 2. Capsela Toy Construction Set

The Modular Mock Turtle

Operation: Mock Turtle begins with the construction of the turtle itself. To keep things simple, you can easily build the device from such widely available toy construction kits such as Erector, Fisher-Technik or Capsela (Figure 2). As shown in Figure 3, our turtle required only four Capsela function modules (two each: motors, gear boxes), two large wheels and a support bracket to hold the control wires. Total cost? Under $15.00. Construction time? Less than two minutes! More or less elaborate designs could be just as easily fabricated, so experiment.

Figure 1. Turtle Dynamics



MOCK TURTLE

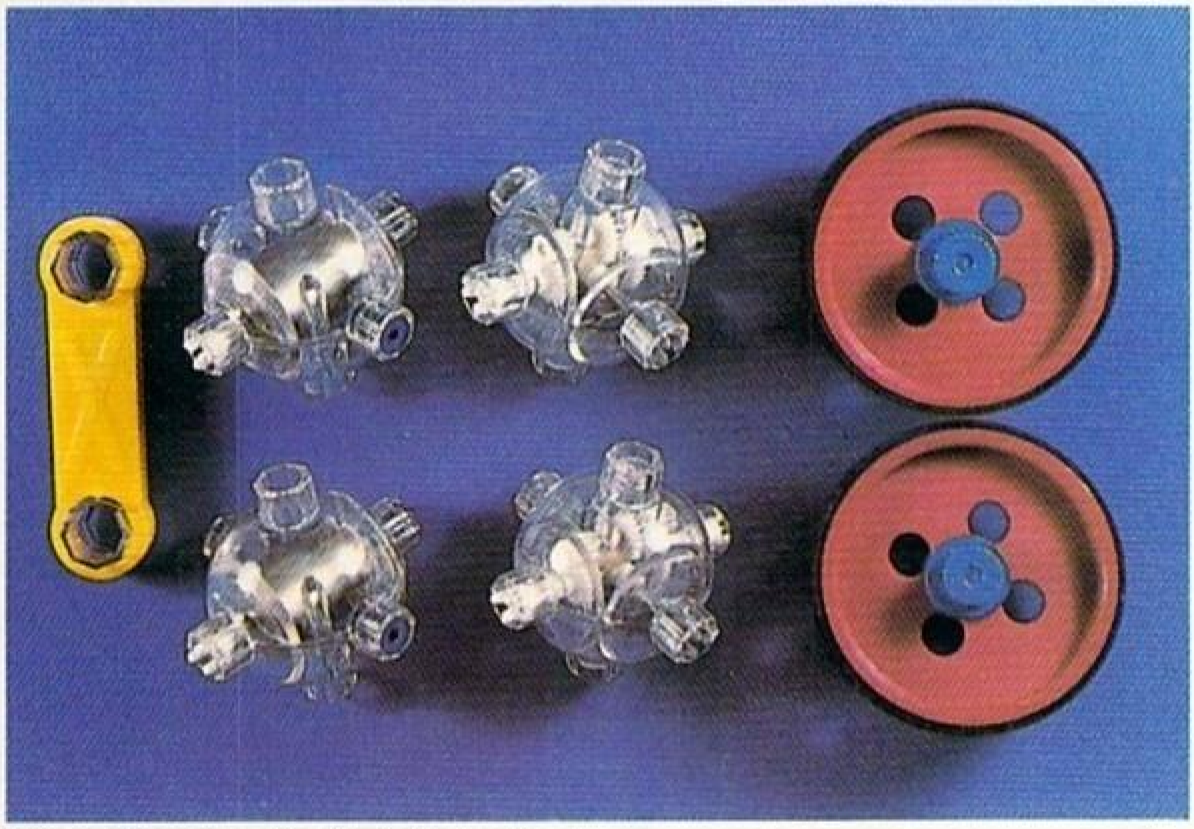


Figure 3. Capsela Parts Required

I/O, I/O, A Turtle Soon We'll Grow

The user port of the 64 serves well as the computer/robot connection point. Since previous issues of *Commodore Power/Play* and *Commodore Microcomputers* have extensively covered the use of this port, we'll just review the basics.

As shown in Figure 4, the microcomputer heart of the 64 talks to the outside world through circuit elements known as Complex Interface Adapters (CIA). The user port is directly connected to one of these elements. The user port makes 24 of the CIA connection points available to the experimenter. Each connection point or "pin" of the user port offers a particular function. The Mock Turtle makes use of just six of these pins, specifically pins C to F for control (PB0 to PB3) and pins 1 and 2 for ground and +5V respectively. The 64 can switch pins C through F on or off (output) or can use them to detect the state (on or off) of a switch or signal (input) outside the computer itself. For now, our turtle will only make use of the output capabilities of these pins.

In theory, the Commodore 64 could control the two motors in the turtle directly. One user port pin would turn the right motor on or off, another would control the left motor. Unfortunately, there's a catch. The CIA element does not have the strength required to control a motor directly. It requires a "buffer." A buffer is a gadget that plugs into the user port and boosts the strength of the port pins. With a buffer, the 64 can easily handle the energy requirements of the turtle's motors. Buffers are available from a number of sources and at reasonable cost (see page 90.). They are an excellent accessory to add to your bag of 64 widgets. Since a buffer is a relatively easy device to build, experienced electronic hobbyists might try it themselves.

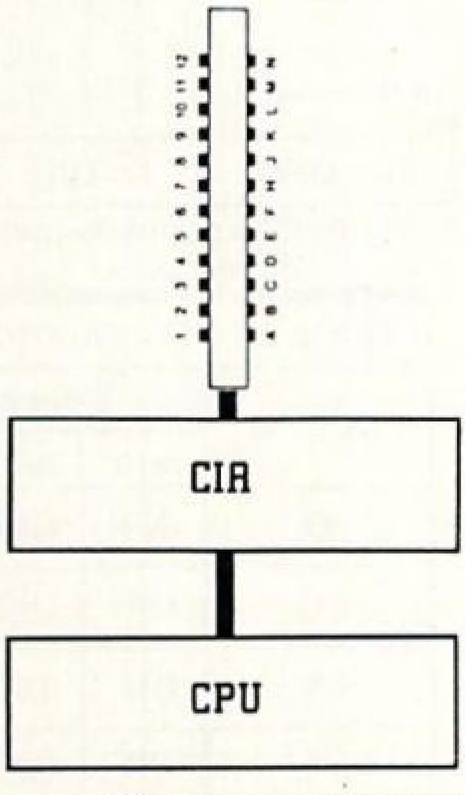


Figure 4. CPU Connection to Real World

This "homebrew" robot does not wash dishes or vacuum the rug. It does, however, make an interesting electro-mechanical pet. And it might teach you a thing or two.

Figure 5 provides the schematic diagram and parts list for a simple buffer suitable for use with the mock turtle. All of the parts can be purchased for under $20 new. If surplus parts are substituted, the price could fall substantially. This buffer is relay-based, which means the state of the 64 user port pins causes a relay (an electromechanical switch) to open or close. This controls the turtle's motors. Figure 6 describes the action. As shown, the microcomputer (a) within the 64 instructs the CIA (b) to turn on or off the appropriate pin in the user port. The user port pin (c) drives small transistors (d) in the buffer. The transistors drive two relays (e) that supply the power to the turtle motors and two relays (f) for the polarity of the power source.

Please Note: Experienced electronic hobbyists should have little difficulty constructing this buffer. Follow the schematic carefully. Make certain to connect the little "freewheel" diodes across the coils of the relay. Failure to do so could result in voltage spike damage to your user port CIA. If you have any doubts concerning your circuit construction capabilities, it is recommended that you purchase one of the commercially-available buffer circuits discussed above.

The entire circuit will easily fit onto a single solderless experimenter's board. So this is perhaps the best way to build the project. These boards are available from Radio Shack or from Continental Specialities Corporation, Box 1942, New Haven, CT, 06509. Along with the board you'll also need a pair of wire strippers, a pair of diagonal wire cutters and a spool of single-strand wire (22 gauge or so). Insert the components into the board sockets then connect them as shown in the schematic of Figure 5. Component placement is not critical, just keep things neat and compact. For a more permanent circuit, the project can be solder-constructed on a single, copper-clad "perf" board, also available from Radio Shack.

Pokey Software

Software remains as the final ingredient for the homebrewed robot. Since the turtle is "driven" via the user port, the software consists of user port control routines. Thanks to the simplicity of the Commodore 64's design, nothing could be easier. Direction control (input or output) of the user port resides at address 56579. A POKE 56579, 255 sets all port pins to outputs. (See the *Commodore 64 Programmer's Reference Guide*, pages 359 to 362 for further details.) Address 56577 is the location for selecting the on/off status of the user port pins. To manipulate the on/off state of the port pins, simply poke the appropriate number to this address. For example:

POKE 56577,0—Turns off all the port pins.

POKE 56577,1—Turns on pin C (PB0) but leaves all other pins off.

POKE 56577,2—Turns on pin D (PB1) but leaves all other pins off.

POKE 56577,3—Turns on pins C (PB0) and D (PB1).

In the examples above, all went well until number three. Logic would indicate that a "3" poke would turn on pin E (PB2). What went wrong? Nothing! Relative to the user port, the poke operation converts decimal numbers into their binary equivalents, so this must be taken into account. Table I presents a refresher on the binary equivalents of the decimal numbers 0 to 15. From this table, one can assemble the control sequence for the turtle. Table II presents the sequence. The Commodore 64 deposits its one final surprise on the unwary I/O programmer. The user port pins

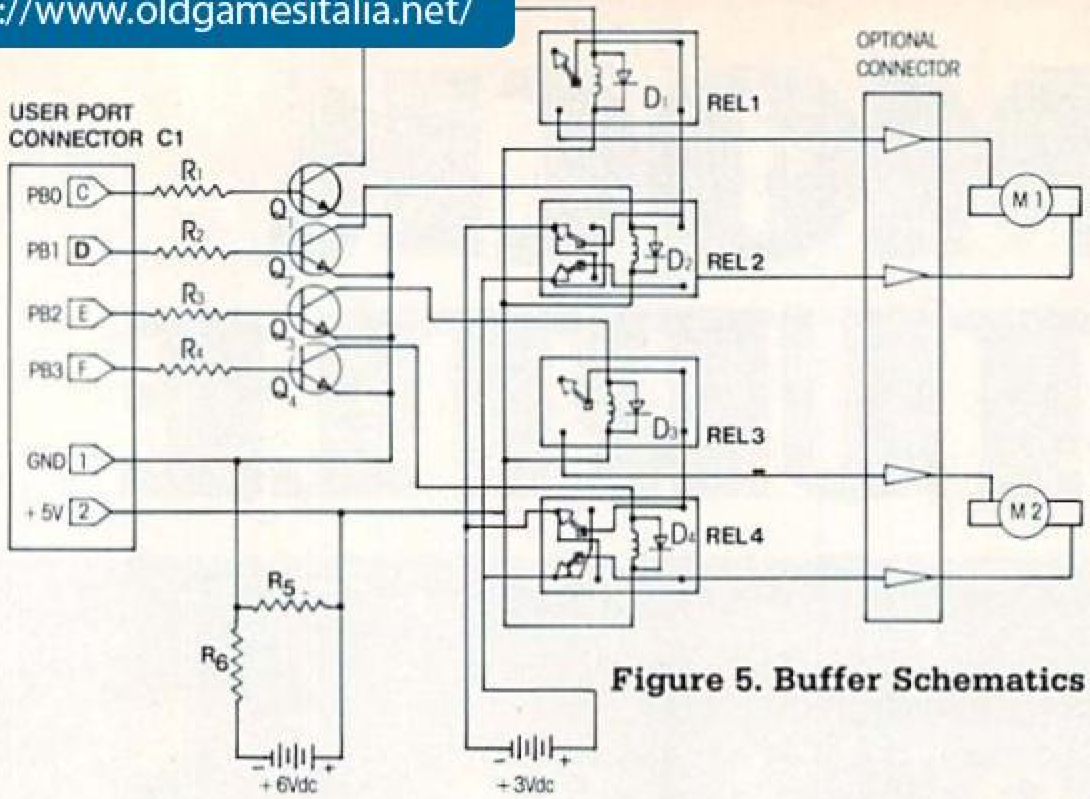


Figure 5. Buffer Schematics

Table I. Binary Equivalents

TABLE I	
0 ———	0 0 0 0
1 ———	0 0 0 1
2 ———	0 0 1 0
3 ———	0 0 1 1
4 ———	0 1 0 0
5 ———	0 1 0 1
6 ———	0 1 1 0
7 ———	0 1 1 1
8 ———	1 0 0 0
9 ———	1 0 0 1
10 ———	1 0 1 0
11 ———	1 0 1 1
12 ———	1 1 0 0
13 ———	1 1 0 1
14 ———	1 1 1 0
15 ———	1 1 1 1
0 = OFF	1 = ON

Parts List

Buffer

R_1 thru R_4	—3.3KΩ	(Radio Shack)
R_5	—1KΩ	(Radio Shack)
R_6	—250Ω	(Radio Shack)
Q_1 - Q_4	—2N2222	(Radio Shack)
REL 1 & 3	—OMRON SPDT Z100-ND (Digi-Key)	
REL 2 & 4	—OMRON DPDT Z115-ND (Digi-Key)	
C_1 -(Connector)	- TI# C1-12	
D_1 - D_4	- IN 4148 (Radio Shack)	

- Source Address -

Relays & Connector
Digi-Key Corporation, Box 677,
Thief Falls, MN 56701
1-800-344-4539

All Else
Radio Shack (Stores Nationwide)

Table II. Command Sequence Parameters

Table II – Command Sequence Parameters					
POKE #	Relay Settings				Turtle Action
	Rel 1	Rel 2	Rel 3	Rel 4	
0	OFF	OFF	OFF	OFF	Stopped
10	ON	OFF	ON	OFF	Forward
15	ON	ON	ON	ON	Reverse
14	ON	ON	ON	OFF	Turn Rt.
11	ON	OFF	ON	ON	Turn Lft.

latch on when the computer is first turned on. This constrains turtle hardware and software design in two areas. First, it means that the buffer or the turtle must have an on/off switch and the switch must be off when you first fire up the 64.

Lacking such a switch, the turtle runs out of control before the software can be loaded and run. The design presented here places the switch in the turtle side of the system. (Experienced hobbyists and designers would suggest a buffer design that inverted the user port outputs. In the interest of simplicity, however, the above design does not invert the port signals and therefore requires an on-/off switch). Second, all control software should set the port pins to off as the first order of business.

Warnings aside, we can now begin programming in earnest

Program 1 lists a streamlined control routine that gives forward, reverse, right turn and left turn control of the turtle via keyboard entry. (In all of the programs presented here, an appropriate remark statement precedes most command lines. Thus, each program should be "self-documenting.")

Program 2 adds joystick control to the turtle's répertoire. This program reads a joystick plugged into control port two (joystick port two; address 56320) and converts the action into the appropriate turtle response. It also prints the current joystick position on the video screen. Notice that the program pokes a zero, i.e., all port pins off, when the joystick is centered.

Program 3 adds a memory function. As the turtle is controlled by the joystick (learn mode), the turtle movements are retained within the memory of the 64. Upon "playback," the turtle will repeat the movement steps memorized in the learn mode.

System Shakedown and Experiments

Armed with all of the appropriate hardware and software, the fun can begin. Figure 7 illustrates the final system. The buffer (the circuit card with four little boxes on it) connects to the user port. The turtle receives its commands over the coiled telephone handset cord. (The phone cord is not absolutely necessary, as any four conductor wire will do, but it adds flexibility.) One outboard battery pack

Program 1. Control Routine

```
10 REM PROGRAM 1 - ROBOT KEYBOARD CNTL
20 REM PROGRAM USES KEYBOARD INPUT TO
30 REM CONTROL THE USER PORT
100 REM FIRST. TURN OFF ALL PORT PINS
105 POKE 56579.255
110 POKE 56577,0
120 REM SET UP KEYBOARD INPUT SCANNER
121 REM X VALS ARE KB ASCII CODES
122 REM FOR THE KEYS F.B,R,L,SPACE
130 X=PEEK(197):REM LOOK AT KB REGISTER
140 IF X=21 THEN POKE 56577.10
141 IF X=21 THEN PRINT "FORWARD"
150 IF X=28 THEN POKE 56577.15
151 IF X=28 THEN PRINT "BACKWARD"
160 IF X=17 THEN POKE 56577.14
161 IF X=17 THEN PRINT "RIGHT"
170 IF X=42 THEN POKE 56577.11
171 IF X=42 THEN PRINT "LEFT"
175 IF X=60 THEN POKE 56577.0
176 IF X=60 THEN PRINT "STOP"
180 GOTO 130
```

Program 2. Joystick Control

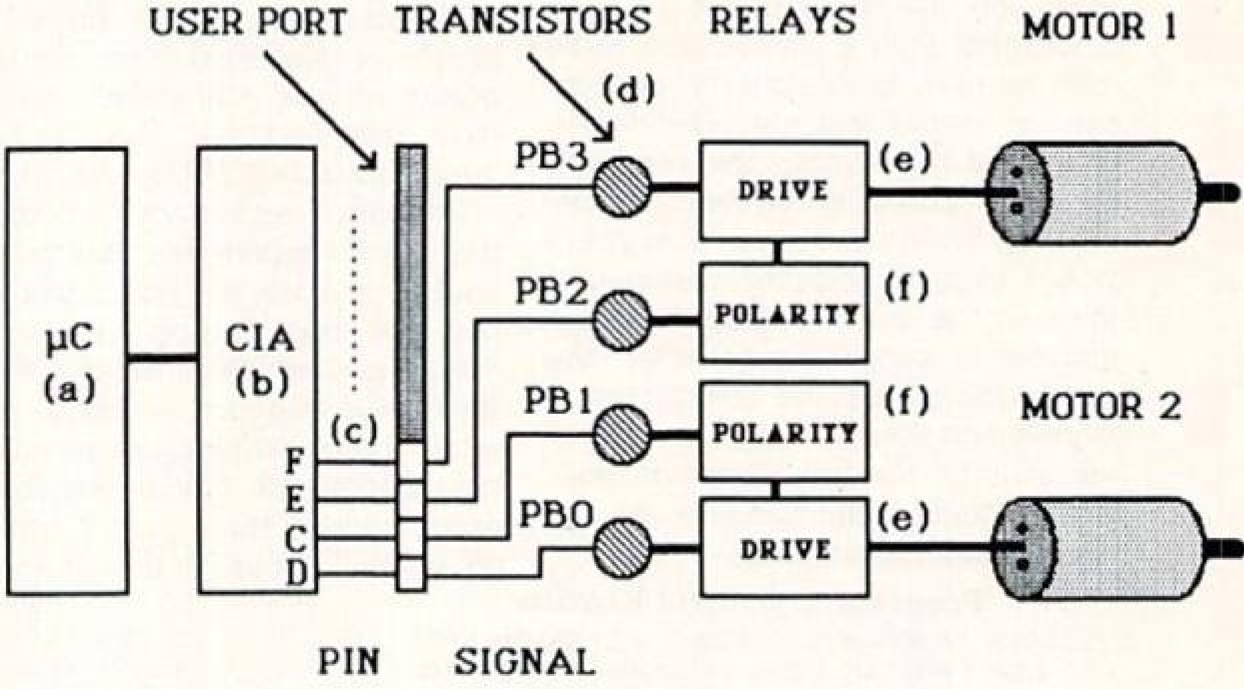
```
1 REM PROGRAM 2-ROBOT WITH JOYSTICK CNTL
2 REM REMARKS ARE ABOVE THE COMMANDS
4 REM SET PORT DIRECTIONS TO OUTPUTS
5 POKE 56579.255
9 REM READ JOYSTICK PORT #2
10 X=PEEK(56320)
29 REM CONVERT THE LAST 5 BITS TO A NO.
30 Z=15-(XAND15):REM DIRECION NUMBER
38 REM TEST SEQUENCE BEGINS HERE
39 REM 0=N,1=FWD. 2=BWD. 4=LFT. 8=RGT
40 IF Z=0 THEN POKE 56577.0
44 REM MOTOR CONTROL=0. ALL OFF
45 IF Z=0 THEN GOTO 10
49 REM TEST FOR FORWARD CONDITION
50 IF Z=1 THEN PRINT "FORWARD"
54 REM MOTOR CNTL=1.ON.OFF.ON.OFF(10)
55 IF Z=1 THEN POKE 56577.10
59 REM TEST FOR BACKWARD CONDITION
60 IF Z=2 THEN PRINT "BACKWARD
64 REM MOTOR CONTROL=2.ON.ON.ON.ON(15)
65 IF Z=2 THEN POKE 56577.15
69 REM TEST FOR LEFT CONDITION
70 IF Z=4 THEN PRINT "LEFT"
74 REM MOTOR CONTROL=4,ON,ON,ON,OFF(14)
75 IF Z=4 THEN POKE 56577.14
79 REM TEST FOR RIGHT CONDITION
80 IF Z=8 THEN PRINT "RIGHT"
84 REM MOTOR CONTROL=8,ON.OFF,ON.ON(11)
85 IF Z=8 THEN POKE 56577.11
94 REM LOOP TO BEGINNING OF PROGRAM
95 GOTO 10
100 END
```

Program 3. Memory Function

```
10 REM PROGRAM 3-ROBOT WITH JS+MEMORY
11 REM REMARKS ARE ABOVE THE COMMANDS
24 REM SET USER PORT TO OUTPUT MODE
25 POKE 56579.255
30 CLR
40 INPUT "ENTER (1)LEARN.(2)PLAYBACK OR (3)QUIT":LP
42 IF LP=2 THEN 500
43 IF LP=3 THEN END
44 REM SET UP MEMORY ARRAY
45 DIM MEM(500):REM ALLOWS 500 STEPS
50 PRINT "PRESS SPACE BAR TO STOP LEARNING"
60 REM INITIALIZE ARRAY VARIABLE
65 A=0
99 REM READ JOYSTICK PORT # 2
100 X=PEEK(56320)
105 REM PEEK KEYBOARD TO STOP LEARNING
106 SP=PEEK(197)
107 IF SP=60 THEN 40
110 REM CONVERT THE LAST 5 BITS TO A #
120 Z=15-(XAND15):REM DIRECION NUMBER
130 REM TEST SEQUENCE BEGINS HERE
140 REM 0=N.1=FWD. 2=BWD. 4=LFT. 8=RGT
150 IF Z=0 THEN POKE 56577,0
160 REM MOTOR CONTROL=0. ALL OFF
165 REM LINE 170 CONTROLS THE PAUSE
166 REM EFFECT. INSERT A GOTO LOOP TO
167 REM PREVENT MEMORIZATION OF PAUSES
170 IF Z=0 THEN PRINT "PAUSE"
180 REM TEST FOR FORWARD CONDITION
200 IF Z=1 THEN PRINT "FORWARD"
210 REM MOTOR CNTL=1.ON,OFF.ON.OFF(10)
220 IF Z=1 THEN POKE 56577.10
230 REM TEST FOR BACKWARD CONDITION
240 IF Z=2 THEN PRINT "BACKWARD
250 REM MOTOR CONTROL=2,ON,ON,ON.ON(15)
260 IF Z=2 THEN POKE 56577.15
270 REM TEST FOR LEFT CONDITION
280 IF Z=4 THEN PRINT "LEFT"
290 REM MOTOR CONTROL=4,ON,ON,ON.OFF(14)
300 IF Z=4 THEN POKE 56577.14
310 REM TEST FOR RIGHT CONDITION
320 IF Z=8 THEN PRINT "RIGHT"
330 REM MOTOR CONTROL=8,ON,OFF,ON.ON(11)
340 IF Z=8 THEN POKE 56577.11
341 REM BUILD THE ARRAY
342 MEM(A)=Z
343 REM INCREMENT THE VARIABLE SUBSCPT
344 A=A+1
350 REM LOOP TO BEGINNING OF PROGRAM
360 GOTO 100
500 REM PLAYBACK ROUTINE
510 REM RESET ARRAY VARIABLE
520 A=0
530 REM BEGIN POKE PLAYBACK
550 REM TEST FOR SCREEN PLAYBACK
```

```
555 IF MEM(A)=0 THEN POKE 56577.0
556 IF MEM(A)=0 THEN PRINT A."PAUSE"
560 IF MEM(A)=1 THEN PRINT "FORWARD"
565 IF MEM(A)=1 THEN POKE 56577,10
570 IF MEM(A)=2 THEN PRINT "BACKWARD"
575 IF MEM(A)=2 THEN POKE 56577,15
580 IF MEM(A)=14 THEN PRINT "RIGHT"
585 IF MEM(A)=14 THEN POKE 56577,14
590 IF MEM(A)=8 THEN PRINT "LEFT"
595 IF MEM(A)=8 THEN POKE 56577,11
600 REM INCREMENT ARRAY VARIABLE
610 A=A+1
620 REM TEST FOR ARRAY EXHAUSTION
621 IF A=500 THEN 1000
630 REM LOOF BACK TO FETCH NEW STEF
640 GOTO 555
1000 INFUT "REFLAY ? Y=1. N=0":H
1010 IF H=1 GOTO 520
1020 IF H=0 GOTO 30
```

Figure 6. How the Turtle Comes Together

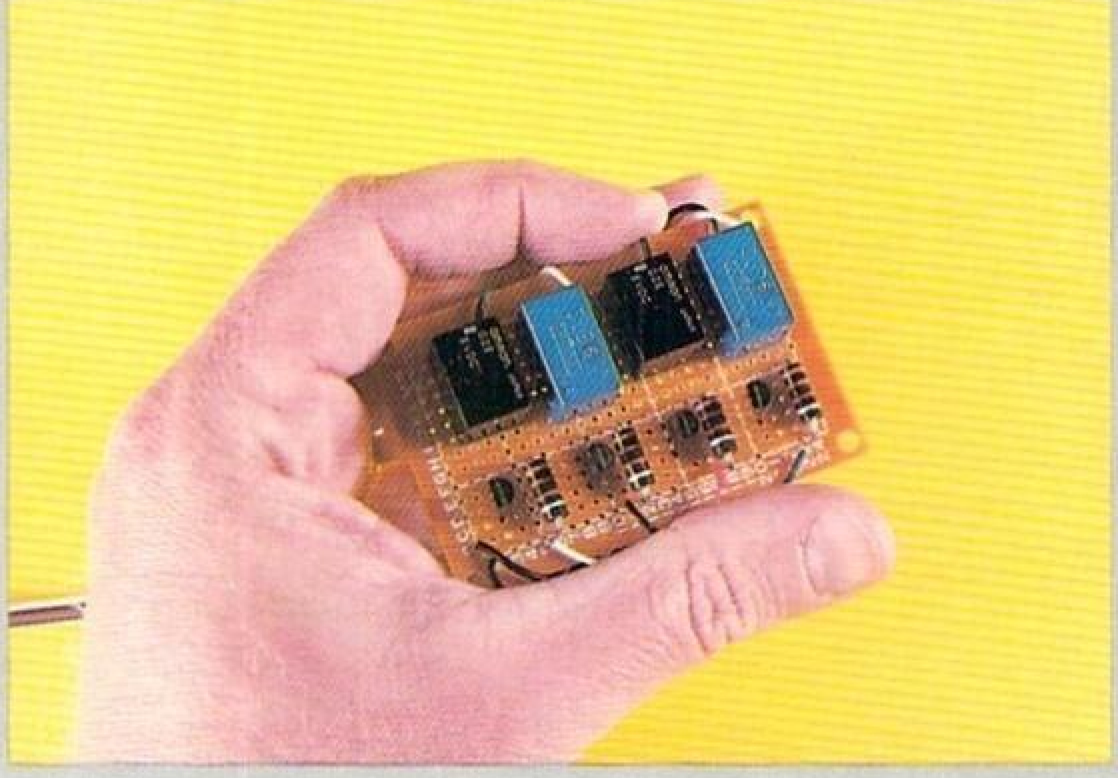


supplies power to the buffer, another to the turtle.

For the first trial run, it's advised that you elevate the robot so its wheels do not make contact with the ground. The little widget moves at a surprisingly fast clip and can quickly become quite tangled should something go wrong. Programs 1 and 2 make excellent debug or shakedown routines. But, with an elevated turtle, even a hand entered—POKE 56579, 255 plus POKE 56577,(10,11,14, or 15) works well. Once you've become satisfied that all is well, lower the "beastie" and let 'er rip! As confidence builds and some of the quirks of the turtle reveal themselves, go creative. Here are a few suggestions:

- Attach a felt-tip pen to the central point of the turtle. Using the joystick/memory program, teach the robot the letters of the alphabet. A slight modification to the program will allow the turtle to "draw" any letter on command. You can store pictures the same way.
- Set up some cardboard barriers and play "Maze Cruise." The object of the game? To be quickest through the maze without knocking over any of the barriers.
- Attach a magnet to the front of the turtle and play "Retrieve the Paper Clips" (you figure it out).
- Build a paper mache cover to give your creation some "personality."
- Devise a software-to-turtle interface to any of the several LOGO language packages available.

In the process of all of this, you'll develop a new understanding of computer I/O control and discover just how much fun robotics can be. Now if we could only cut the control cord and build an untethered "house rover." Ah . . . but that's another story.



Buffer Manufacturers

Those not inclined to roll their own interface buffer can purchase one from any of several manufacturers.

The Ontologix Division of Knowles and Hazlett (326 Third Avenue, Pittsburgh, PA 15222. Phone (412) 391-6707) markets a diverse variety of buffers and buffer software for the 64 with prices starting at $12.95. Ontologix products are also available from a number of mail order outlets and from local computer shops.

Crabapple Systems (118 Commercial Street, Portland, ME 04101; Phone (207) 772-8610) offers a line of "Kelp" interface kits. Complete packages, including hardware, software, cables and instructions, start at $59.95, if ordered directly.

For Business, Doctor's and Home Phones

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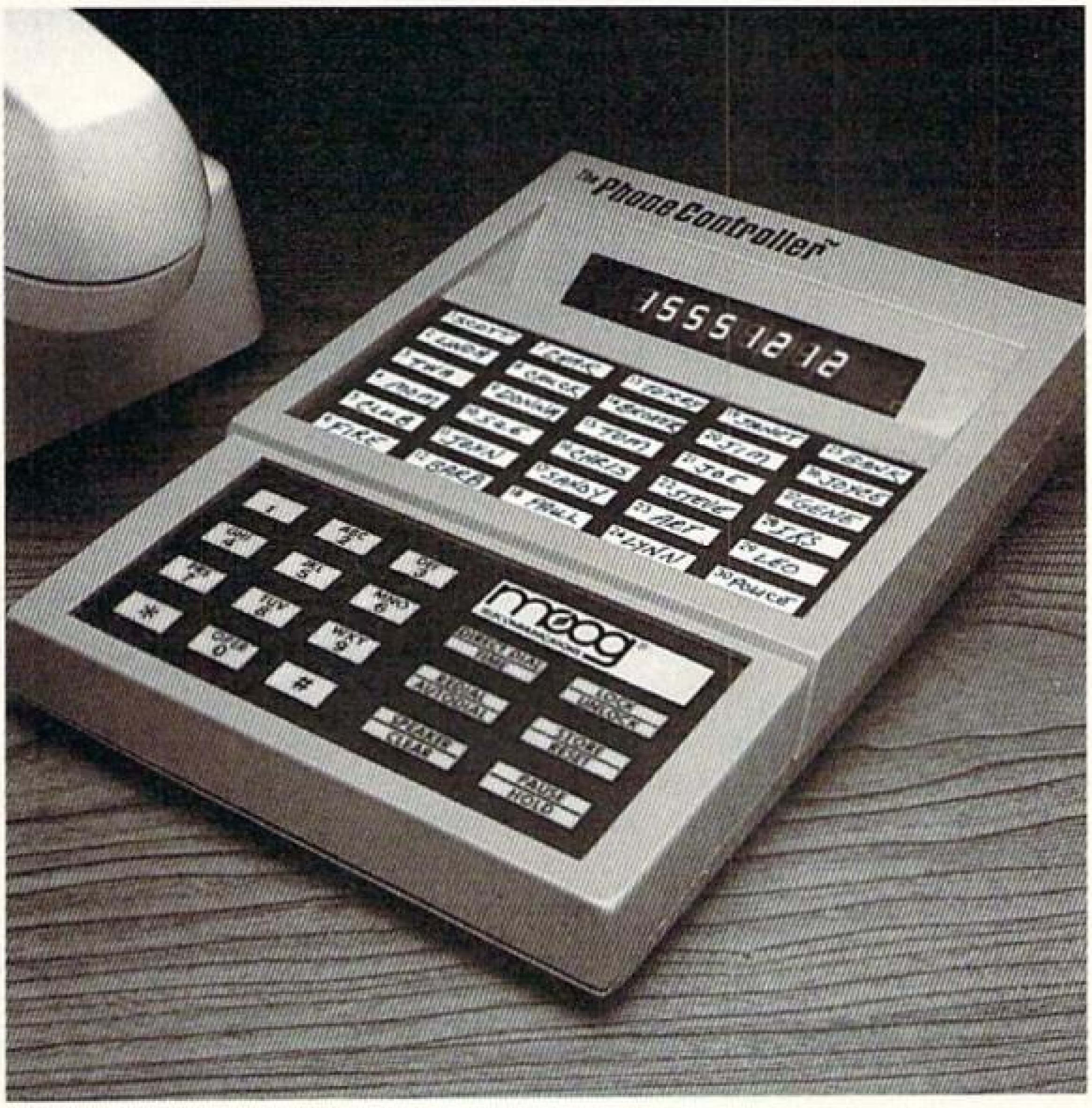

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For earlier delivery, call toll-free 1-800-334-0854, 7 days, 24 hours.

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BY GARY FIELDS

Force I for the Commodore 64

It is autumn 1944. War, again, has consumed Western Europe. A mixture of fog and darkness conceal the battlefield's terror.

You shift your weight atop the turret of your steel war machine and squint into the mist and darkness. You hope to catch a glimpse of the approaching enemy.

Above the rumble of your own tank's engines you can hear nothing. Scouts are in the darkness searching for a trace of the enemy force. They have discovered and marked two minefields, but the enemy's position is still a mystery.

Then, as the morning sun cuts through the darkness, four enemy tanks materialize out of the fog. The peace of the darkness is shattered by the sound of incoming artillery pounding around your ears. Almost helplessly you watch as each steel monster turns, aims and fires. Your tank takes two direct hits, but survives.

Quickly you go through your drill. Lower the gun, FIRE, lower the gun again, FIRE, FIRE, FIRE, elevate, FIRE.

You are lucky. You score two direct hits. Your tank is damaged, although still fit to fight, but two of the enemy's are reduced to burning hulks.

Pouring on fuel, you try to evade the enemy's next salvo. Your engines roar in response as the enemy artillery continues.

Welcome to Force I and good luck!

To Begin

After you have carefully duplicated the program listing and saved it, type RUN and press RETURN. The screen will turn red and the title will be displayed. It takes about 45 seconds for the game to set up. When the game is ready, the screen will turn black and you will see a blue tank advancing and firing on four red tanks. To begin, simply wait or press the F1 key. To quit, press the F8 key.

Your Mission

Objective: The U.S. objective is to seize six miles of enemy territory. To do this, you must capture each of the enemy's depots by occupying the square containing the enemy's depot icon. You may be able to bypass enemy tanks and seize the objective using speed. But if you push across enemy territory too quickly, you may expose your tank to enemy artillery. Or the enemy may simply destroy its own depot rather than allow it to fall into your hands. They will normally do this if they believe they have enough tanks on the battlefield to win.

If you have eliminated all enemy forces, you can simply "walk" to victory. If you have eliminated most of the enemy, you may be able to steal a victory by bypassing the opposition and attacking the depot. If you simply try to outflank all the enemy tanks and seize the enemy depot, look out for big trouble. *Caution*: Do *not* destroy the enemy depot. To win, you must seize it intact. A destroyed depot is of no use.

Tank Specifications

U.S. Tank (blue)

Mobility: Superior to the enemy; six moves for each enemy single move.

Gun Strength: Superior power, reloading and firing speed. But range is shorter than enemy's.

Armor: Thick steel protection; can withstand five times as much punishment as an enemy tank.

Support: None. No artillery support, limited resources, limited fuel supply.

Scouts: Twelve scout missions can be launched during each one-mile phase. Sometimes the scouts are helpful. Other times they return no useful information. Scouting missions consume valuable time and fuel.

Supplies: Ammunition and fuel are acquired by passing through the depot (blue flag with "D"). Once emptied, the depot will eventually refill but the tank is limited as to how much ammunition and fuel it can carry. It is best to use nearly all ammunition and fuel before "topping off." *Caution:* Do *not* run out of fuel.

German Panzer (red)

Mobility: The German tanks are slower than the U.S. tank. They will take cautious, calculated moves, knowing their strength is in numbers.

Gun Strength: The enemy tanks mount a lower caliber gun, but have superior range. This enables them to pound the U.S. tank and depot from a distance. Fortunately, the peripheral vision of the enemy's tanks is limited, allowing the U.S. tank to (sometimes) outflank an enemy tank.

Armor: Thinner than U.S. One direct hit will knock an enemy tank out of the battle.

Support: The enemy tanks are supported by strong artillery. The primary goal of the artillery is to defend its own depot and destroy the U.S. depot. But should the U.S. tank hold one position too long after it has been spotted by enemy force, it will attract enemy artillery action.

Scouts: The enemy has no trouble detecting U.S. minefields. But often the enemy will choose to blast a path through those minefields rather than waste time working around them. The fact that the player controls only one tank can work as an advantage. The enemy, finding it hard to believe the U.S. force is so small, may waste time looking for your non-existent support.

Supplies: The enemy normally will have no problem supplying his forces. Even if the enemy destroys his own depot rather than letting it fall to U.S. forces, the enemy tanks will normally have enough supplies to fight until supply lines are re-established.

Damage Report: If you cross over a mine, it will explode and damage the underside of your tank. No damage will show from the air, but your damage count will decrease by one. When the U.S. tank is hit by enemy fire, the damage is done to the top surface of the tank. It will show as a burnt gray, which will remain until you

Will Brown

move your tank again. A direct hit by enemy fire decreases the damage count by one. If the damage count falls to zero, your tank is unrepairable and the battle lost. After each mile of enemy territory, you are allowed time to repair your tank. A very clever commander might end the battle with a stronger tank than he began with. (But don't bet on it.)

Screen Display

You are given an airplane's view of the battlefield. At the top of the screen is your objective, the enemy's depot, displayed as a red icon. Your own depot is displayed as a blue flag with a "D." It is protected on two sides with reinforced concrete. The U.S. tank will be near the lower edge of the battlefield, displayed in blue.

Depending on the region of Europe in which the battle takes place, the screen may display a forest, nearly open plains or a mixture of open and wooded areas. Trees are displayed as orange and green circular objects. It is autumn and the trees are changing color. Tanks must pass around trees. However, if need be, they can be blasted away.

Barbwire is visible. It is composed of the gray, X-shaped objects. Tanks can roll through this barrier. But it does require more fuel to pass through barbwire than open field.

Reinforced concrete bunkers and tank traps are displayed. They are gray and have two shapes. From the air they appear to be concrete blocks. Tanks must either blast through or pass around these defenses.

The series of white dots is a marked minefield. Other hidden minefields may exist. One way to detect hidden mines is to send out scouts. If they spot a minefield, they will mark it in red. Avoid minefields. Either pass around or blast a path through them.

Enemy tanks are not shown until they are close enough to be spotted by the driver of the U.S. tank. One way to detect them ahead of time is to send out scouts. When a scout spots an enemy tank, it will be displayed on the screen in red, and will remain visible until it moves. Another way to detect enemy movement is to watch the screen. If barbwire disappears, you know an enemy tank has passed over it. If an explosion not caused by firing your own gun occurs, it was caused either by enemy artillery or an enemy tank. (Note: In desperate situations, you may try to use enemy artillery fire to your own advantage. If the enemy artillery is very heavy and you maneuver near enemy tanks, they may be hit by their own incoming artillery.)

The solid barriers, top and bottom, divide each single mile of battlefield. Neither the enemy nor the U.S. tank can cross these borders unless the objective has been taken. Blasting the borders with artillery fire has no effect other than to waste ammunition.

Top Row: The top left corner of the screen keeps track of options (MOVE or FIRE), whose turn it is and when enemy artillery has fired. The "SCOUTS:" indicates how many scout missions are still available.

Gun Elev: Indicates at what angle the U.S. tank's gun is elevated. A nine is maximum for maximum range. A one would be point-blank firing. *Note*: Accuracy decreases as elevation increases. The gun's elevation will automatically be decreased when the tank nears the borders of the battlefield. This is to prevent the program from "firing" into the computer's coded memory and damaging it, as well as preventing shots from "wrapping around" the screen.

Ammo: Displays how many rounds of ammunition the U.S. tank carries.

Fuel: The maximum fuel the U.S. tank can carry is 1,000.

Damage: Keeps track of the condition of the U.S. tank. The U.S. tank begins with a damage/repair ratio of five. Maximum would be ten. Below one is considered destroyed.

Sq/Mile: Displays the current battlefield screen. You must seize six miles to win the battle.

Count: Keeps track of the number of enemy tanks destroyed.

(F7): Scouts: Simply a reminder that pressing the F7

key sends out a scout. Scouts can be sent on missions only during the "move" phase of the game.

(F8): Restart: Reminds you to press F8 when you want to play a new game or quit.

Game Controls

The U.S. tank can be controlled by either the keyboard or combination of joystick (port 2) and keyboard.

Fire Command (two): When the upper left corner of the screen flashes "FIRE CMD:" you can elevate and fire your tank's cannon. To fire, simply press the fire button of your joystick. Using the keyboard, you press F1 to fire, press F3 to elevate the gun, and press F5 to lower the gun.

Note: there are two "fire" phases to each "move" phase. The time length of the first fire phase is determined by how much ammunition the U.S. tank is carrying. The more ammo, the more time to fire. The second fire phase, following the MOVE CMD phase, allows the tank commander to fire a maximum of four shells.

U.S. Move Command: When the upper left corner of the screen displays "MOVE CMD:" you can move your tank—advance, retreat, move to the depot, etc. You are allowed six moves. If you wish to pass, simply press the RETURN key.

To move the tank, press the joystick in the direction you wish the tank to move. You will hear the engines speed up and the tank will move. If the move requires changing the direction in which the tank is headed, you must spend one move rotating the tank.

If you prefer to keep your hands on the keyboard, you can move the tank by using four keys:

E moves tank North
X moves tank South
S moves tank West
D moves tank East

Enemy Move: When the upper left corner of the screen displays "ENEMY MOVE:" the enemy (computer-controlled) moves and fires. Normally the computer will move all of its tanks. You may be able to judge the size of the enemy's force by the amount of time it takes to move. When the words "ENEMY MOVE" only flash, you can suspect that you have destroyed most, if not all, enemy tanks on this particular battlefield.

Stop Action: To pause, hold the SHIFT key down and press the space bar. To continue, press the space bar again.

Winning: To win you must seize all the enemy depots, without being destroyed yourself. To seize the enemy's depot, move your tank onto that square. The screen will then change, displaying either the next mile of battlefield and a new objective or the victory screen. Your depot will be advanced to the next screen too. Your tank will be refueled, using supplies seized at the enemy's depot. Your tank's damage report will also be increased by one.

If you successfully seize all objectives, the victory screen will be displayed, showing your victory count. The program will re-display each defeated enemy tank, then each will be fired upon, destroyed and replaced with an icon. **C**

Before typing in this program, read "How to Enter Programs."

Force I

```
2 PRINT CHR$(147)CHR$(5):POKE 53281,2
  :POKE 53280,2:GOTO 35000'GFIJ
3 POKE 53281,0:POKE 53280,0
  :IF X>1 THEN 35032'FXYI
4 V1=54296:H1=54273:L1=54272:A1=54277
  :S1=54278:W1=54276:CC=54272
  :SQ=1'IJXU
5 H2=54280:L2=54279:A2=54284:S2=54285
  :W2=54283:FS=700:DR=5:AM=10
  :GE=5'JINW
10 CH$=CHR$(147):H$=CHR$(19):SC=12
   :POKE V1,15'GBOG
22 GOSUB 50:GOSUB 35032'CIGC
23 PRINT"[WHITE]":GOSUB 30000
   :POKE 1944+CC,2:GOTO 1000'FUNI
24 POKE W1,0:POKE H1,255:POKE L1,0
   :POKE A1,180:POKE S1,240:POKE W1,33
   :RETURN'HMJO
25 POKE W1,0:POKE H1,0:POKE L1,200
   :POKE A1,140:POKE S1,0:POKE W1,33
   :RETURN'HKXO
27 POKE W1,0:POKE H1,12:POKE L1,120
   :POKE A1,8:POKE S1,0:POKE W1,129
   :RETURN'HKLQ
28 POKE W1,130:POKE H1,2:POKE L1,120
   :POKE W1,129:RETURN'FBYO
29 POKE W1,130:POKE H1,2:POKE L1,2
   :POKE A1,60:POKE S1,0:POKE W1,129
   :RETURN'HKLS
30 TF=1:RP=PEEK(EP):IF RP<33 OR RP>46
   THEN TF=0'JWTK
31 FOR B=1 TO TC:IF EP=ET(B)THEN
   ET(B)=1944:POKE 1944,34:ED=ED+1
   :RE=RE-1'MQQR
32 NEXT:IF EP=MT THEN DR=DR-1
   :GOSUB 150'HOLI
33 GOSUB 25:FOR D1=0 TO 50:NEXT
   :GOSUB 27:POKE EP,60:POKE EC,5
   :FOR D1=0 TO 15:NEXT'MFHP
34 GOSUB 28:POKE EP,62:POKE EC,7
   :FOR D1=0 TO 70:NEXT'HUIL
35 GOSUB 29:FOR D1=0 TO 250:NEXT
   :POKE EP,63:POKE EC,8
   :FOR D1=0 TO 250:NEXT'LESQ
36 POKE EP,32:POKE EC,0'CKNI
37 IF RP=46 THEN TF=0:RP=0
   :GOTO 34'GOIN
38 IF TF=1 AND RP<37 THEN POKE EP,62
   :POKE EC,11:GOTO 1100'IXWR
39 POKE EP,32:POKE EC,0:RETURN'DLHM
40 FOR D1=54272 TO 54296:POKE D1,0
   :NEXT D1:RETURN'GVTH
45 L%=INT(RND(0)*3)+2:RETURN'GKGK
50 GOSUB 40:POKE V1,2:POKE H1,0
   :POKE L1,240:POKE A1,0'FYBI
```

```
51 POKE S1,240:POKE W1,33:RETURN'DNSG
52 POKE V1,6:POKE H1,1:FOR D1=0 TO 200
   :NEXT:FS=FS-5:RETURN'JYPN
55 IF FS<1 THEN FS=0:Y=6:GOSUB 1530
   :GOSUB 1530:GOSUB 1530'IYJQ
56 RETURN'BAQH
60 POKE ET(E),32:POKE ET(E)+CC,0
   :RETURN'ETUI
100 IF DX<1 THEN DX=1:RETURN'FHXY
102 IF DY<1 THEN DY=1:RETURN'FHAB
104 IF DX>38 THEN DX=38:RETURN'FJGE
105 IF DY>16 THEN DY=16:RETURN'FJAF
106 IF MT-UD<1104 THEN 130'ELKG
107 IF MT+UD>1783 THEN 130'ELUH
108 POKE MT,32:POKE MT+CC,0
    :MT=MT+UD'FTFL
109 IF PEEK(MT)=32 THEN 130'EJTI
110 IF MT=OB THEN RETURN'EENY
112 IF PEEK(MT)=46 THEN EP=MT:EC=MT+CC
    :GOSUB 30:Y=6:GOTO 130'KCRL
116 IF PEEK(MT)=38 THEN FS=FS-6
    :GOSUB 40:GOSUB 52:Y=Y+2
    :GOTO 130'LAQO
118 IF PEEK(MT)=42 THEN FS=1000:AM=30
    :GOTO 130'HVLN
120 IF PEEK(MT)<>32 THEN MT=MT-UD'HMFE
122 IF TS=36 THEN DX=DX+1'FJJE
123 IF TS=33 THEN DY=DY-1'FJJF
124 IF TS=34 THEN DX=DX-1'FJIG
125 IF TS=35 THEN DY=DY+1'FJKH
130 POKE MT,TS:POKE MT+CC,6
    :RETURN'ENOD
140 IF SC<1 THEN RETURN'EDHC
141 X=0:ND=INT(RND(0)*400)+1144'GRXH
142 ND=ND+1:X=X+1:IF PEEK(ND)>32 AND
    PEEK(ND)<37 THEN POKE ND+CC,2'NDSQ
143 IF PEEK(ND)=46 THEN POKE ND+CC,
    2'GMTI
144 IF X>39 THEN FS=FS-70:SC=SC-1
    :Y=Y+1:RETURN'KUJO
145 J=1:IF SC>9 THEN J=0'FISJ
146 PRINT H$TAB(25)"[WHITE]
    SCOUTS@"SPC(J)SC:GOTO 142'ENJM
150 J=1:IF SC>9 THEN J=0'FISF
151 PRINT H$" REPORTS @";
    TAB(14)CHR$(18)"[GRAY1]FORCE
    [SHFT SPACE]I[RVOFF,WHITE]";'DLOL
152 PRINT TAB(25)"SCOUTS@"SPC(J)SC
    :AS=0:IF AM<10 THEN AS=1'ITPN
153 PRINT H$:FOR D1=0 TO 17:PRINT:NEXT
    :IF FS<1 THEN FS=0'KRWN
154 PRINT"[L. GREEN]GUN ELEV@[WHITE]";
    GE;TAB(14)"[RED]AMMO [L. BLUE]'
    [WHITE]@"SPC(AS)AM;TAB(26);'ERVP
155 PRINT"[BROWN]FUEL@[WHITE,SPACE8]"
    :PRINT CHR$(145)TAB(33)FS
    :IF DR<1 THEN DR=0:Y=6'JVFS
156 PRINT"[L. BLUE]![WHITE]
     DAMAGE@"DR;:PRINT
    TAB(20)"SQ/MILE@"SQ'DJYP
157 PRINT TAB(1)"[SPACE2]COUNT@"ED;
    TAB(20)"[F7]@SCOUTS "'DIYQ
158 PRINT"[SPACE2]RETURN@
    PASS"TAB(20)"[F8]@RESTART";'CEGR
161 RETURN'BAQC
200 IF PEEK(MT)=33 THEN EP=MT-(GE*40)
    :T%=33'IVWG
202 IF PEEK(MT)=34 THEN EP=MT+GE:T%=34
    :GOTO 223'IVQI
204 IF PEEK(MT)=35 THEN EP=MT+(GE*40)
    :T%=35'IVAK
206 IF PEEK(MT)=36 THEN EP=MT-GE:T%=36
    :GOTO 223'IVVM
209 IF GE>3 THEN L%=INT(RND(0)*2)+1
    :EP=EP+L%-2:GOTO 220'MYLS
210 IF GE=3 THEN L%=INT(RND(0)*2)
    :EP=EP+L%:GOTO 220'KWJI
220 EC=EP+CC:GOSUB 30:RETURN'EKPC
223 IF GE<3 THEN 220'DGFE
224 IF GE=3 THEN L%=INT(RND(0)*2)
    +2'IMSJ
225 IF GE>3 THEN GOSUB 45'EFBG
227 IF GE>6 THEN L%=INT(RND(0)*5)
    +1'IMWM
230 ON L%GOTO 231,232,233,234,235'CVAE
231 EP=EP+80:GOTO 220'DKSE
232 EP=EP+40:GOTO 220'DKOF
233 EP=EP:GOTO 220'CIAF
234 EP=EP-40:GOTO 220'DKPH
235 EP=EP-80:GOTO 220'DKTI
300 GOSUB 52:Y=Y+1:IF PEEK(MT)<>36
    THEN POKE MT,36:FS=FS-6:TS=36
    :RETURN'NFIM
302 UD=-1:DX=DX-1:GOTO 100'FNWF
400 GOSUB 52:Y=Y+1:IF PEEK(MT)<>33
    THEN POKE MT,33:FS=FS-2:TS=33
    :RETURN'NFUN
402 UD=-40:DY=DY+1:GOTO 100'FOYG
500 GOSUB 52:Y=Y+1:IF PEEK(MT)<>34
    THEN POKE MT,34:FS=FS-6:TS=34
    :RETURN'NFCO
502 UD=1:DX=DX+1:GOTO 100'ENGG
600 GOSUB 52:Y=Y+1:IF PEEK(MT)<>35
    THEN POKE MT,35:FS=FS-2:TS=35
    :RETURN'NFBP
602 UD=40:DY=DY-1:GOTO 100'EOFI
610 FOR X=0 TO D STEP S'EEIE
611 IF(ET(E)+X-MF)=MT THEN GOSUB 45
    :EP=MT:GOSUB 230:GOSUB 650
    :X=D'KFMP
612 IF(ET(E)+X-MF)=DP+1 THEN EP=DP+1
    :EC=DP+1+CC:GOSUB 30:GOSUB 650
    :GOSUB 30:X=D'POAW
619 NEXT:RETURN'CBXL
650 FOR D1=0 TO 100:NEXT:RETURN'FITJ
700 IF E>AX THEN E=0:RETURN'FGAF
702 IF RE<1 THEN RETURN'EDIG
704 PT=0:IF ABS(MT-ET(E))<160 THEN
    PT=2'HTTO
705 IF ET(E)>1783 THEN RETURN'EJOK
706 IF ET(E)<1104 THEN RETURN'EJDL
707 IF ET(E)>1600 THEN GOSUB 45
    :EP=DP+1:GOSUB 230'HVBR
708 IF DY>11 THEN IF RE>2 THEN GOSUB
    45:EP=OB:GOSUB 230'JSQS
709 IF DR<1 THEN RETURN'EDHN
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710 IF ND>15 THEN D=520:S=40:MF=120
    :POKE ET(E),CH:GOSUB 610'IGYO
714 IF ND>20 THEN D=12:S=1:MF=12
    :POKE ET(E),36:GOSUB 610
    :IF L%>3 THEN GOSUB 610'MKOV
715 IF ND>40 THEN D=12:S=1:MF=0
    :POKE ET(E),34:GOSUB 610
    :IF L%>4 THEN GOSUB 610'MJOW
716 IF ND<15 THEN D=240:S=-80:MF=120
    :POKE ET(E),CH:GOSUB 610
    :IF L%>3 THEN GOSUB 610'NNXY
717 IF DR<1 THEN RETURN'EDHM
720 IF ABS(ET(E)-MT)=1 THEN EP=MT
    :EC=MT+CC:GOSUB 30'JYMO
722 IF ABS(ET(E)-MT)=40 THEN EP=MT
    :EC=MT+CC:GOSUB 30'JAHR
725 IF ET(E)+40>1702 AND DY<3 THEN
    GOSUB 45:EP=DP+1:GOSUB 230
    :GOTO 735'LFQV
730 IF MT-ET(E)>20 THEN CH=35:WA%=40
    :GOTO 740'HXHN
732 IF MT-ET(E)<-20 THEN CH=33:WA%=-40
    :GOTO 740'JXMR
733 IF ET(E)<MT THEN IF ET(E)-MT<DX
    THEN CH=34:WA%=1:GOTO 740'KEPU
734 IF ET(E)>MT THEN IF ET(E)-MT<39
    THEN CH=36:WA%=-1:GOTO 740'LEIW
735 WA%=0:CH=35:RETURN'DKTN
740 EY=PEEK(ET(E)+WA%):IF EY<>32 THEN
    GOSUB 900'IUQO
800 POKE ET(E),32:ET(E)=ET(E)+WA%
    :POKE ET(E),CH:POKE ET(E)+CC,PT
    :RETURN'HSJQ
900 IF EY=38 THEN RETURN'EEWG
902 IF EY=46 THEN GOTO 995'EHCJ
904 IF EY>36 THEN EY=INT(RND(0)*20)
    :IF EY>15 THEN GOTO 995'LVSS
906 EY=INT(RND(0)*4)+1'FJBO
908 IF EY=1 THEN 735'DGGO
910 IF EY=2 THEN IF PEEK(ET(E)+1)=32
    THEN WA%=1:CH=34:RETURN'LXUQ
912 IF EY=3 THEN IF PEEK(ET(E)-1)=32
    THEN WA%=-1:CH=36:RETURN'MXPT
914 IF EY>3 THEN IF PEEK(ET(E)-40)=32
    THEN WA%=-40:CH=33:RETURN'MAMV
990 GOTO 735'BDON
995 EP=ET(E)+WA%:EC=EP+CC:GOSUB 30
    :RETURN'GVIB
1000 FS=FS-1:GOSUB 50:GOSUB 150
     :IF DR<1 THEN 4050'HUWB
1001 GOSUB 1200:GOSUB 2500:Y=0
     :POKE 198,0'ESIA
1002 PRINT H$"[L. BLUE] MOVE CMD@"
     :GOSUB 55'CFYA
1003 GOSUB 1200:IF FS>0 THEN ON JV
     GOSUB 400,600,1525,300,1525,1525,
     1525,500'GUXI
1004 GOSUB 40:GOSUB 50:GET Q$
     :IF Q$=CHR$(140)THEN 4050'HURF
1005 GOSUB 1140:IF MT=OB AND OC=1
     THEN 5000'GQOF
1006 IF Q$=CHR$(160)THEN GOSUB
     4060'FLTE
1007 IF Q$=CHR$(136)THEN GOSUB
     140'FKTF
1008 IF Q$=CHR$(13)THEN Y=6'FIWG
1009 IF FS<1 AND AM<1 THEN GOSUB 152
     :GOTO 4050'HODJ
1010 GOSUB 152:IF Y<6 THEN 1002'EKYX
1011 POKE 198,0:FL=4:GOSUB 2501
     :PRINT H$CHR$(18)"[RED]
     ENEMY MOVE[WHITE]"'FVXF
1012 ND=INT(RND(0)*150)+1'FLMB
1014 IF ND>100 AND PEEK(DP+1)=32 THEN
     POKE DP+1,42:POKE DP+CC+1,6'MBIL
1015 IF ND<50 THEN POKE OB,44
     :POKE OB+CC,2'GQKG
1019 GOSUB 2000:IF DR<1 THEN 4050'EMDH
1020 IF DY>14 AND RE>2 THEN GOSUB
     1500'GLVB
1021 IF RE<2 THEN 1028'DHUY
1022 IF ND>80 THEN IF DR>1 THEN GOSUB
     1500'HLRD
1028 OC=0:IF PEEK(OB)=44 THEN
     OC=1'GNTK
1029 IF Q$=CHR$(13)THEN GOSUB 45
     :IF L%=3 THEN GOSUB 1530'JQBM
1030 GOTO 1000'BEXW
1100 IF TF=1 THEN IF EP=MT THEN IF
     DR>0 THEN TF=INT(RND(0)*4)+1
     :POKE MT,TF+32:TF=0'RGIM
1140 IF Q$="E"THEN GOSUB 400'EFQB
1141 IF Q$="X"THEN GOSUB 600'EFMC
1142 IF Q$="D"THEN GOSUB 500'EFQD
1143 IF Q$="S"THEN GOSUB 300'EFEE
1144 IF DY>13 THEN IF RE>2 THEN IF
     DR>0 THEN L%=INT(RND(0)*2)+2
     :EP=MT:GOSUB 230'QDNS
1145 IF DR<1 THEN Y=6'EFLG
1146 GOSUB 50:RETURN'CDKF
1200 JV=PEEK(56320):FR=JV AND 16
     :JV=15-(JV AND 15):RETURN'IDKH
1500 IF DY>12 AND RE>1 THEN 1530'FLLD
1508 IF DY>8 AND RE>2 THEN 1530'FKTL
1510 IF DY>6 AND RE>3 THEN 1530'FKSE
1515 IF DY>3 AND RE>4 THEN 1530'FKQJ
1520 EY=INT(RND(0)*20):IF EY>18 THEN
     1530'HSPI
1525 RETURN'BAQF
1530 PRINT H$"[RED]INCOMING@[WHITE]'"
     :X=INT(RND(0)*6)-3:EP=MT+X
     :EC=EP+CC'KYQQ
1532 GOSUB 24:FOR D1=0 TO 500:NEXT
     :GOSUB 40:GOSUB 30'HQDK
1540 RETURN'BAQC
2000 FOR E=0 TO AX:IF ET(E)=1944 THEN
     2004'GSBB
2002 GOSUB 700:IF DR<1 THEN E=AX'FKDB
2004 NEXT E:RETURN'CCRY
2500 POKE 198,0:FL=AM'CKKC
2501 IF DR<1 THEN RETURN'EDHD
2502 FOR Y=0 TO FL:PRINT H$CHR$(18)"
     GUN CMD @[WHITE]":GET Q$'GOHK
2503 IF Q$=CHR$(13)THEN Y=FL
     :GOTO 2620'GOEI
2504 IF Q$=CHR$(134)THEN GE=GE+1
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     :IF GE>8 THEN GE=9'KTGO
2505 IF Q$=CHR$(160)THEN GOSUB
     4060'FLTJ
2506 IF Q$=CHR$(135)THEN GE=GE-1
     :IF GE<2 THEN GE=1'KTBP
2507 IF Q$=CHR$(140)THEN 4050'ELGK
2508 IF MT<1265 AND PEEK(MT)=33 AND
     GE>3 THEN GE=3'JSTR
2510 IF DX<9 THEN IF PEEK(MT)=36 THEN
     IF GE>DX THEN GE=DX'LRJL
2512 IF DX>31 THEN IF PEEK(MT)=34
     THEN IF GE>39-DX THEN
     GE=39-DX'NWTP
2514 IF DY<5 THEN IF PEEK(MT)=35 THEN
     IF GE>5 THEN GE=5'LPFO
2600 PRINT H$"[L. RED] FIRE CMD@
     [WHITE]"'BCJE
2604 GOSUB 1200'BEEF
2605 IF AM<1 THEN AM=0:GOTO 2620'FLKK
2610 IF Q$=CHR$(133)THEN FR=0'FKEG
2612 IF FR=0 THEN AM=AM-1:GOSUB 200
     :FS=FS-2'ISTM
2620 FS=FS-1:GOSUB 152:NEXT Y
     :RETURN'FMBH
4050 POKE 198,0:PRINT H$:PRINT:PRINT
     :PRINT:PRINT"[WHITE]TRY AGAIN
     [Y/N]"'GMTL
4052 GET Q$:IF Q$=""THEN 4052'EJPH
4054 IF Q$="Y"THEN PRINT CH$:CLR:X=1
     :GOTO 3'HLJM
4056 IF Q$<>"N"THEN 4052'EGLL
4058 GOSUB 40:SYS 64738'CIML
4060 POKE 198,0:PRINT H$"[YELLOW,
     SPACE2]PAUSE[SPACE3,WHITE]"'CIEH
4062 GET Q$:IF Q$=""THEN 4060'EJOI
4063 PRINT H$"[SPACE10]":RETURN'CDNI
5000 GOSUB 40:IF SQ>5 THEN 5008'EKEB
5002 SQ=SQ+1:DR=DR+1:SC=12:ZX=0:
     :FS=1000:AM=AM+15:IF AM>24 THEN
     AM=24'NTBS
5004 GOTO 23'BCMB
5008 PRINT CHR$(147)"THE BATTLE IS
     WON"'CFGL
5010 ED=ED*2:FOR X=1 TO ED
     :L%=INT(RND(0)*4)+1
     :POKE 1104+X,L%+32'NGYN
5011 POKE 1104+X+CC,2:X=X+1
     :FOR SQ=0 TO 50:NEXT SQ:NEXT'KXBK
5012 POKE 1964,33:POKE 1964+CC,6'DQBF
5014 FOR X=1 TO ED:EP=1104+X:EC=EP+CC
     :GOSUB 24:FOR D1=0 TO 100:NEXT D1
     :GOSUB 30'NKHS
5016 POKE EP,44:POKE EC,2:X=X+1:NEXT
     :GOSUB 40:FOR X=0 TO 12:PRINT
     :NEXT'LAUQ
5018 PRINT CHR$(18)" FINAL SCORE
     "'CEFL
5020 PRINT:PRINT" TOTAL ENEMY COUNT
     "ED/2'DEMG
5022 PRINT" FINAL DAMAGE REPORT
     "DR'BCOH
5024 PRINT:PRINT CHR$(18)" BATTLE
     RECORD "((DR*100)+(AM*10)+FS)
     *SC'IYYR
5030 FOR X=0 TO 1000:NEXT
     :GOTO 4050'FMDF
30000 PRINT CH$:PRINT:FOR X=0 TO 39
      :PRINT";";:NEXT'HMMA
30001 FOR X=0 TO 15:PRINT:NEXT
      :FOR X=0 TO 39:PRINT";";
      :NEXT'KOTD
30010 TC=5:TR=INT(RND(0)*60)+5'GOQB
30012 FOR X=0 TO TR:Y=INT(RND(0)*640)
      +1144:POKE Y,37:POKE Y+CC,
      TC'LFJE
30014 IF TC=5 THEN TC=9
      :GOTO 30020'FMID
30016 IF TC=9 THEN TC=5'EGYE
30020 NEXT'BAEU
30026 BW=INT(RND(0)*10)+1'FKQA
30028 FOR X=0 TO BW:Y=INT(RND(0)*560)
      +1184'ISLG
30029 FOR Z=O TO 4:POKE Y+Z,38
      :POKE Y+Z+CC,11:NEXT:NEXT'KTUI
30036 BW=INT(RND(0)*10)+1'FKQB
30038 FOR X=0 TO BW:Y=INT(RND(0)*560)
      +1184:FOR Z=O TO 2'LWQK
30039 POKE Y+Z,43:POKE Y+Z+1,45:
      :POKE Y+Z+CC,11:POKE Y+Z+CC+1,11
      :NEXT:NEXT'OHMP
30040 BW=INT(RND(0)*30)+2:FOR X=0 TO 4
      :BW=BW+40'KVMC
30042 POKE BW+1264,61:POKE BW+1264+CC,
      12:NEXT'GWYB
30050 Z=INT(RND(0)*6)+1'FILD
30051 MF=INT(RND(0)*15)+2'FKQE
30052 Y=INT(RND(0)*40)+1560
      :Y=Y+MF'HRXC
30054 FOR X=0 TO Z:POKE Y+X,46
      :POKE Y+X+CC,15:NEXT'JSLG
30056 Z=Z-1:FOR X=0 TO Z
      :POKE Y+X+40,46:POKE Y+X+40+CC,
      15:NEXT'NBNM
30057 Z=Z-1:FOR X=0 TO Z
      :POKE Y+X+80,46:POKE Y+X+80+CC,
      15:NEXT'NBVN
30060 Z=INT(RND(0)*8)+2'FIOE
30062 FOR X=0 TO Z:Y=INT(RND(0)*500)+1
      :Y=1144+Y:POKE Y,46
      :POKE Y+CC,0'NHCK
30064 HM(X)=Y:NEXT'CHFA
30070 X=INT(RND(0)*30)+2:OB=X+1144
      :POKE OB,44:POKE OB+CC,2'KFBH
30090 X=INT(RND(0)*19)+1:MT=X+1744
      :DX=X:DY=1:TS=33:POKE MT,TS
      :POKE MT+CC,6'NSTP
30098 X=INT(RND(0)*20)+17
      :DP=X+1704'HSKM
30099 POKE DP,61:POKE DP+1,42
      :POKE DP+2,61:POKE DP-39,32
      :POKE DP+41,32'JKRS
30100 POKE DP+CC,11:POKE DP+1+CC,6
      :POKE DP+2+CC,11'IYKE
30102 IF SQ=0 THEN X=3'EFTY
30103 IF SQ=1 THEN X=4'EFVA
30104 IF SQ=2 THEN X=5'EFXB
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30106 IF SQ=3 THEN X=6'EFAD
30107 IF SQ>3 THEN X=7'EFAE
30110 TC=INT(RND(1)*X)+3:RE=TC
      :AX=TC'HTME
30115 FOR X=1 TO TC:Y=INT(RND(0)*75)+1
      :ET(X)=Y+1184'KALG
30120 POKE ET(X),35:POKE ET(X)+CC,0
      :NEXT'ETYC
30125 RETURN'BAQB
35000 PRINT CHR$(5)CHR$(147):PRINT
      :PRINT'FKND
35020 PRINT" [GREEN]%[WHITE] [SHFT U,
      SHFT C3] [SHFT U,SHFT C3,SHFT I]
       [SHFT U,SHFT C3,SHFT I]
      [SHFT U,SHFT C3,SHFT I] [SHFT U,
      SHFT C2,SPACE4,SHFT C,CMDR R,
      SHFT C]"'BAKP
35022 PRINT"[SPACE3,SHFT B] [GREEN]%%
      [WHITE] [SHFT B] [ORANGE]%
      [WHITE] [SHFT B] [SHFT B,SPACE3,
      SHFT B] [SHFT B] [GREEN]%
      [ORANGE]%[WHITE,SPACE2,SHFT B,
      SPACE7,SHFT B]"'BAAH
35024 PRINT"[SPACE3,CMDR Q,SHFT C2,
      SPACE2,SHFT B,SPACE3,SHFT B]
      [CMDR Q,SHFT C,CMDR R,SHFT C,
      SHFT K] [SHFT B,SPACE2,ORANGE]%
      [WHITE,SPACE2,CMDR Q,SHFT C,
      SPACE2,GREEN]%%[WHITE,SPACE2,
      SHFT B]"'BAMM
35026 PRINT"[SPACE3,SHFT B,SPACE4,
      SHFT B] [ORANGE]%[WHITE]
      [SHFT B] [SHFT B,RED]#[WHITE]
      [SHFT M,SPACE2,SHFT B,RED]#
      [WHITE,SPACE3,ORANGE]%[WHITE,
      SHFT B] [RED]#[WHITE,SPACE5,
      SHFT B]"'BAOL
35028 PRINT" [ORANGE]%[GREEN]%[WHITE,
      SHFT B,RED] #[WHITE,SPACE2,
      SHFT J,SHFT C3,SHFT K] [SHFT B]
       [GREEN]%[WHITE] [SHFT T]
      [SHFT J,SHFT C3,SHFT K] [SHFT J,
      SHFT C3] [ORANGE]%[WHITE]
      [SHFT C,CMDR E,SHFT C]"'BAAV
35030 PRINT:PRINT TAB(11)"[RED],
      [WHITE] BY G[SPACE2]FIELDS
      [BLUE]*[WHITE]":GOTO 47000'EKED
35032 PRINT H$:FOR X=0 TO 9:PRINT:NEXT
      :PRINT TAB(12)"[WHITE]
      JOYSTICK PORT@2"'IMSI
35034 PRINT:PRINT TAB(14)"F1 TO BEGIN"
      :PRINT:PRINT TAB(14)"F8 TO
      QUIT"'GJGJ
35036 X=INT(RND(0)*20)+15:X=X+1904
      :Y=X+CC:POKE X,33:POKE Y,6'LGUP
35040 GOSUB 40:GOSUB 50:GET Q$
      :IF Q$=CHR$(133)THEN RETURN'IQKE
35041 X=X-40:Y=Y-40:IF X<1300 THEN
      RETURN'IPFF
35042 EP=INT(RND(0)*3)+1:EP=EP+X
      :EC=EP+CC:GOSUB 30
      :IF Q$=CHR$(140)THEN 4050'OMXP
35043 IF EP-X>1 THEN EP=EP+36:EC=EC+36
      :GOSUB 30'JULJ
35044 POKE Y+40,0:POKE X,33
      :POKE Y,6'EOKF
35045 FOR Z=0 TO 1:EP=INT(RND(0)*40)+1
      :EP=1274+EP:EC=EP+CC'MFHQ
35046 GOSUB 30:NEXT Z'CEGE
35200 IF Q$<>CHR$(133)THEN 35040'FMGF
40001 DATA 033,008,008,107,107,127,
      127,127,099'BKWC
40002 DATA 034,000,252,252,112,127,
      112,252,252'BKWD
40003 DATA 035,198,254,254,254,214,
      214,016,016'BKXE
40004 DATA 036,063,063,014,254,014,
      063,063,000'BKCF
40005 DATA 037,036,094,187,127,234,
      119,092,016'BKHA
40006 DATA 038,000,134,073,048,073,
      134,000,000'BKUB
40008 DATA 039,198,214,108,040,040,
      056,056,016'BKTD
40011 DATA 060,016,147,199,235,203,
      203,008,008'BKQD
40012 DATA 062,022,052,008,003,216,
      004,062,038'BKXE
40013 DATA 063,066,000,194,011,068,
      034,065,152'BKNF
40015 DATA 058,255,170,255,160,224,
      160,224,160'BKSB
40016 DATA 059,255,170,255,000,000,
      000,000,000'BKHC
40017 DATA 061,255,085,255,044,052,
      044,052,044'BKSD
40018 DATA 043,240,088,168,248,063,
      037,058,015'BKHE
40019 DATA 045,015,058,037,063,248,
      168,088,240'BKJF
40020 DATA 046,000,204,000,051,000,
      204,000,051'BKVD
40021 DATA 000,000,096,096,000,000,
      096,096,000'BKVE
40022 DATA 042,255,142,180,180,142,
      255,192,192'BKWF
40023 DATA 044,000,255,177,183,129,
      237,141,255,-1'BNNA
47000 PRINT:PRINT TAB(14)"WAIT WHILE"
      :PRINT:PRINT TAB(14)"THE
      TROOPS"'GJJG
47001 PRINT:PRINT TAB(17)"DRESS"'DEMA
47002 POKE 56,48:CLR'CGLF
47003 POKE 56334,PEEK(56334)AND 254
      :POKE 1,PEEK(1)AND 251'GABG
47004 FOR I=0 TO 2047:POKE 12288+I,
      PEEK(53248+I):NEXT'IXRI
47005 POKE 1,PEEK(1)OR 4
      :POKE 56334,PEEK(56334)OR 1'GVXI
47006 READ A:IF A=-1 THEN 47008'FJGG
47007 FOR I=0 TO 7:READ B
      :POKE 12288+A*8+I,B:NEXT
      :GOTO 47006'KXQN
47008 POKE 53272,(PEEK(53272)AND
      240)OR 12'EUHJ
47009 RUN 3'BBNE
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END

BY BRUCE JAEGER

Baudleship

The game of "Battleship" for two players, with computers connected by modems (for the Commodore 64 or VIC 20 with 8K memory expansion).

Most computer games are single-player: you vs. the computer. There is nothing wrong with that, really. The computer is always a willing, uncomplaining opponent, doesn't cheat (hopefully), and does a good job of keeping score. Nevertheless, there are many multi-person games that could put the computer's powers to good use. The trouble is, it isn't practical to play them on a computer because the players can see each other's moves and strategies. Sure, you can say to your friend, "Okay, turn your back now while I sit down and type in my move," but this wears thin very quickly.

But today, when Commodore modems are inexpensive and plentiful, who says you have to both be sitting at the same computer anymore? With proper software, you can be sitting comfortably in your favorite computer chair and play a game over the telephone lines with a friend who's also sitting in a favorite chair!

As an example of inter-computer software, here's a program that allows two players to play the familiar graph-paper game "Battleship." Each player "hides" a submarine (two squares long), destroyer (three squares), cruiser (four squares), and battleship (five squares) on a ten-by-ten grid. In this version, each player then calls a "shot" using the number and letter coordinates of a particular square they guess a ship might be lying in. The winner is the first one to sink all the enemy's ships.

Playing Baudleship

Carefully type in the appropriate program (either 64 version or VIC 20; your VIC must have at least an 8K memory expansion cartridge). Then call up your opponent, who must also have a modem and one of these programs. (Yes, a VIC 20 owner may play a 64 owner! The only difference is that the VIC screen doesn't have enough room to display your own ships and show you how badly they are being hit.)

Of course, you don't *have* to use the telephone. The modems will work quite nicely in the same room or office, connected by a telephone cord. I've even successfully connected a coiled handset cord from a 1600 VIC Modem to a 1650 AutoModem. It's a loose fit in the larger AutoModem connector, but it still works!

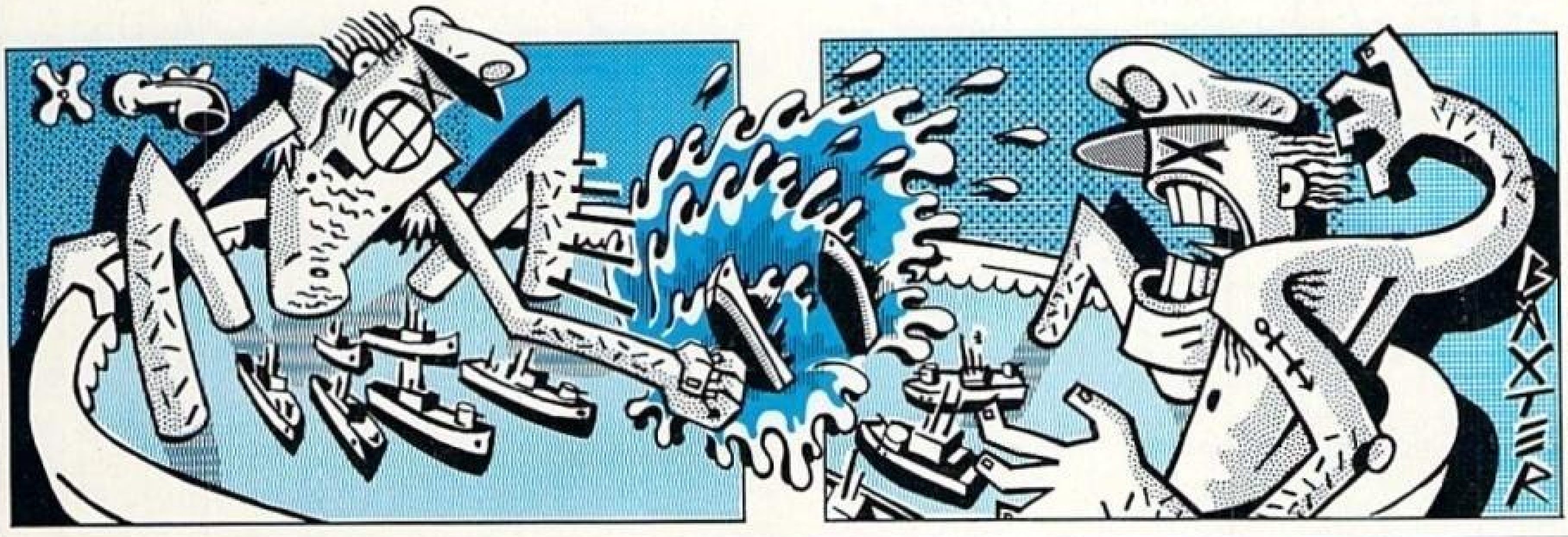
Once you've established contact, run the program, put your modems on-line (by plugging the cord from the handset into the 1600 VICModem, or by putting the data switch to Data on the 1650 AutoModem and hanging up the regular telephone). The program will start you out in "chat" mode; anything you type will be sent to the other person. (Like, "Ready to play? I'm gonna beat you...")

Press the F1 function key to begin play. If you're the first to press it, a message will automatically be sent to the other computer, telling your opponent "Press the F1 key. I have." Then give your name when the computer asks.

There will now be a slight delay while the two computers decide randomly who plays first. Then a ten-by-ten grid will appear on the screen. It's time to hide your ships.

You place a ship by first giving a starting coordinate, in military-style column/row fashion. Then pick one of eight directions to extend the rest of the ship. Entries that place part of a ship off the grid or on top of another ship will not be allowed.

The computers will know when both players are ready. Two grids will appear on the screen, the left one



with your ships, and the right one (initially blank) to keep track of your shots at the enemy. (VIC owners will not have the left grid.) The player to go first will see a flashing "YOUR TURN (F1)." He may either push F1, and then enter his shot against the other player, or type a message to the other player as in the starting-up "chat" mode. I feel it's vital to allow for some form of personal message passing in games of this sort.

If you hit the other player's ship, you hear an explosion and see a reverse-video character appear on your target grid. If your opponent finds *your* ship, you hear the shell come whistling in and explode with a flash—soon followed, no doubt, by a nasty message from your opponent bragging about his or her shooting ability, and how you don't stand a chance!

When one player wins, you go back to "chat" mode, and have the option to press "F1" and start again.

Good hunting! ■

Before typing in this program, read "How to Enter Programs."

Baudleship: 64 version

```
120 OPEN 1,2,3,CHR$(6):REM OPEN
    RS-232 CHANNEL'DCYF
130 DIM B%(10,10): REM SHIP GRID
    MATRIX'CYKF
140 POKE 53280,0:POKE 53281,0
    :POKE 54272+24,8'EAJG
150 BT$="[HOME,DOWN24]"'BDXD
160 M$=LEFT$(BT$,16)'CKLE
170 ME$="":FOR Q=1 TO 39:ME$=ME$+" "
    :NEXT'HQSK
180 BL$=ME$:MY$=ME$:S6=54272'DVEJ
190 CR$=CHR$(13):F1$=CHR$(133)
    :DS$="$"'FUHL
200 C$(0)="[YELLOW]":C$(1)="[GREEN]
    "'CLSA
210 PRINT CHR$(147)CHR$(142)CHR$(8)
    'ENAC
220 S$(1)=CHR$(28)+CHR$(42)'ENJD
230 FOR X=2 TO 5:READ S$(X):NEXT'FKAE
240 DATA SUBMARINE,DESTROYER,CRUISER,
    BATTLESHIP'BNWL
250 TS=14:HS=14:BP=1:GOTO 1460'ESFH
260 GOSUB 2230:REM BOTH PLAYERS
    READY?'CWEJ
270 IF N$<>""THEN 330'EFHG
280 N$="C64":INPUT"[CLEAR,WHITE]
    YOUR NAME";N$'CGMK
290 IF N$=""THEN 280'DFOH
300 PRINT"[DOWN2]WAIT..."'BADY
310 GOSUB 1950:REM SEND NAME TO OTHER
    COMPUTER, WAIT FOR HIS'COWK
330 REM INPUT SHIP COORDINATES'BUQG
340 PRINT"[CLEAR]":P=0:GOSUB 680
    :REM PRINT GRID'ERVI
350 FOR X=2 TO 5:GOSUB 1370'EIOG
360 FOR J=1 TO 10'DEDF
370 : FOR K=1 TO 10'DFMG
380 : IF B%(J,K)=X THEN B%(J,K)=0'ERXL
390 NEXT K,J'BDQH
400 GOSUB 890:REM ERASE DIRECTION
    AID'CVNE
410 PRINT M$"[WHITE]ENTER "S$(X)"
    [SPACE3]"'BHYD
420 GOSUB 1140:REM GET
    COORDINATES'CTEG
430 IF B%(V,H)<>0 THEN GOSUB 1060
    :GOTO 360:REM SHIP THERE
    ALREADY'HIKN
440 GOSUB 840:REM PRINT DIRECTION
    AID'CVMI
450 POKE 198,0:WAIT 198,1:GET D$'DOMH
460 CK=0:FOR Y=1 TO 8'EHQI
470 IF MID$("TYUGJBNM",Y,
    1)=D$THEN 490'ELSM
480 NEXT Y:GOSUB 1060:GOTO 450'DKVJ
490 ON Y GOTO 500,510,520,530,540,550,
    560,570'CHGO
500 XD=-1:YD=-1:GOTO 580'FLNE
510 XD= 0:YD=-1:GOTO 580'ELQF
520 XD= 1:YD=-1:GOTO 580'ELRG
530 XD=-1:YD= 0:GOTO 580'ELQH
540 XD= 1:YD= 0:GOTO 580'DLBH
550 XD=-1:YD= 1:GOTO 580'ELRJ
560 XD= 0:YD= 1:GOTO 580'DLBJ
570 XD= 1:YD= 1:GOTO 580'DLCK
580 L=1:B%(V,H)=X'CLTK
590 X1=H+XD:Y1=V+YD:L=L+1'GPIQ
600 IF X1>10 OR Y1>10 THEN GOSUB 1060
    :GOTO 360'HQAH
610 IF X1<1 OR Y1<1 THEN GOSUB 1060
    :GOTO 360'HOII
620 IF B%(Y1,X1)<>0 THEN GOSUB 1060
    :GOTO 360'GSIJ
630 B%(Y1,X1)=X'BKBG
640 IF L<X THEN H=X1:V=Y1
    :GOTO 590'GNGL
650 G=0:GOSUB 940'CGPH
660 NEXT X:GOSUB 890'CFPI
670 GOTO 1400 :REM SKIP TO PLAY
    ROUTINES'CXJO
680 REM GRID DRAWING SUBROUTINE'BVIO
690 PRINT TAB(P*18)CHR$(19)C$(P)'ENIO
700 PRINT TAB(P*18)"[SPACE2,CMDR P10]
    "'DEIK
710 PRINT TAB(P*18)"0[CMDR N,SHFT @10]
    "'DESM
720 PRINT TAB(P*18)"1[CMDR N,SHFT @10]
    "'DETN
730 PRINT TAB(P*18)"2[CMDR N,SHFT @10]
    "'DEUO
740 PRINT TAB(P*18)"3[CMDR N,SHFT @10]
    "'DEVP
750 PRINT TAB(P*18)"4[CMDR N,SHFT @10]
    "'DEWQ
760 PRINT TAB(P*18)"5[CMDR N,SHFT @10]
    "'DEXR
770 PRINT TAB(P*18)"6[CMDR N,SHFT @10]
    "'DEYS
780 PRINT TAB(P*18)"7[CMDR N,SHFT @10]
    "'DEAT
790 PRINT TAB(P*18)"8[CMDR N,SHFT @10]
    "'DEBU
800 PRINT TAB(P*18)"9[CMDR N,SHFT @10]
```

```
    "'DECM
810 PRINT TAB(P*18)"[SPACE2,CMDR Y10]
    "'DEHN
820 PRINT TAB(P*18)"[SPACE2]
    ABCDEFGHIJ"'DECJ
830 RETURN'BAQF
840 PRINT"[HOME,SPACE10]
    DIRECTION?"'BANK
850 PRINT TAB(13)"[DOWN,RVS]TYU"'CDPJ
860 PRINT TAB(13)"[RVS]G J"'CDQK
870 PRINT TAB(13)"[RVS]BNM"'CDLL
880 RETURN'BAQK
890 PRINT"[HOME,SPACE20]"'BASO
900 PRINT TAB(13)"[DOWN,SPACE3]"'CDHF
910 PRINT TAB(13)"[SPACE3]"'CDPG
920 PRINT TAB(13)"[SPACE3]"'CDPH
930 RETURN'BAQG
940 REM DRAW SHIPS ON GRID
    SUBROUTINE'BAXP
950 GOSUB 1370:PRINT"[HOME,DOWN2]";
    'CGEK
960 FOR J=1 TO 10'DEDL
970 PRINT"[RIGHT2]"TAB(G*18)'DEAM
980 FOR K=1 TO 10'DEEN
990 S=B%(J,K):IF S=0 THEN PRINT"
    [RIGHT]";:GOTO 1020'GRYT
1000 IF S=1 THEN PRINT"[RED,RVS]
     [RVOFF]";:GOTO 1020'FIMX
1010 PRINT CHR$(18)CHR$(5)LEFT$(S$(S),
     1)CHR$(146);'FWEB
1020 NEXT K:PRINT:NEXT J:RETURN'EFJX
1030 REM BEEPS SUBROUTINE'BPOB
1040 GOSUB 1120:POKE S6+1,130
     :POKE S6+5,9:POKE S6+15,30
     :POKE S6+24,5'JIRJ
1050 POKE S6+4,21:FOR DE=1 TO 25:NEXT
     :POKE S6+4,20:POKE S6+24,0
     :RETURN'LDGK
1060 REM BAPPS SUBROUTINE'BPVE
1070 PRINT M$"[DOWN3,RVS]
     BAD ENTRY"'BCHD
1080 POKE S6+24,12:POKE S6+6,240
     :POKE S6+4,17'GWJJ
1090 FOR A=1 TO 2 : FOR B=1 TO 255
     STEP 25'HLUI
1100 POKE S6+1,B:NEXT B,A
     :POKE S6+4,32'FQGA
1110 POKE S6+4,32'CGRW
1120 FOR Q=0 TO 24:POKE S6+Q,0
     :NEXT'GLRC
1130 PRINT M$"[DOWN3,SPACE10]"
     :RETURN'CDSA
1140 REM COORDINATE INPUT
     SUBROUTINE'BAXG
1150 PRINT LEFT$(BT$,17)"[WHITE]
     COORDINATES? (V,H)"'CICG
1160 PRINT"[SPACE4]":PRINT"[UP]";'CCJC
1170 POKE 198,0:WAIT 198,1:GET V$'DOFF
1180 IF ASC(V$)<48 OR ASC(V$)>57 THEN
     GOSUB 1060:GOTO 1170'JVGM
1190 PRINT M$"[DOWN2]"V$"-";'BFPF
1200 POKE 198,0:WAIT 198,1:GET H$'DOQY
1210 IF ASC(H$)<65 OR ASC(H$)>74 THEN
     GOSUB 1060:GOTO 1200'JVBF
1220 PRINT M$"[DOWN2,RIGHT2]"H$'BEJX
1230 H=ASC(H$)-64:V=ASC(V$)-47'GPWF
1240 RETURN'BAQY
1250 REM HIT NOISE SUBROUTINE'BSCG
1260 FOR Q=0 TO 24:POKE S6+Q,0:NEXT
     :POKE S6+24,8'ISXJ
1270 POKE S6+5,192:POKE S6+6,250'EPUH
1280 FOR Q=120 TO 80 STEP-1'FHRH
1290 POKE S6+1,Q:POKE S6+4,17
     :FOR DE=1 TO 8:NEXT DE,Q'IWJO
1300 POKE 53280,2:POKE 53281,2'CPPA
1310 POKE S6+24,15:POKE S6+1,15
     :POKE S6+4,128'GWKF
1320 FOR VO=15 TO 0 STEP-1
     :FOR DE=1 TO 10:NEXT DE
     :POKE S6+24,VO:NEXT'MYEK
1330 POKE 53280,0:POKE 53281,0
     : RETURN'DQLD
1340 POKE S6+24,9:POKE S6+5,9
     :POKE S6+1,20'GTUH
1350 POKE S6+4,128:FOR D=1 TO 10:NEXT
     :POKE S6+4,129:GOTO 1310'JBOL
1360 REM CLEAR MESSAGE SCREEN
     SUBROUTINE'BDCK
1370 PRINT M$BL$:FOR Q=1 TO 3
     :PRINT BL$:NEXT:RETURN'HPNK
1380 REM'BARE
1390 REM READY FOR GAME'BMFJ
1400 GOSUB 1370 : REM CLEAR MESSAGE
     AREA'CVPD
1410 P=0'BCYY
1420 GOSUB 680 : REM DRAW GRID'CMVD
1430 P=1:GOSUB 680'CGBC
1440 PRINT"[HOME,YELLOW,SPACE2]
     "N$TAB(18)"[GREEN,SPACE2]
     "N1$'CIAF
1450 GOSUB 940:REM DRAW ON GRID'COCG
1460 GV=0:PRINT LEFT$(BT$,21);'DNNH
1470 PRINT"[RED,SHFT *40]";
     CHR$(19)'CFDL
1480 IF BP=0 THEN GOSUB 2140
     :REM OTHER PLAYER READY?'FAWO
1490 REM MAIN PLAYING LOOP'BPCL
1500 REM ***** INPUT FROM OTHER
     COMPUTER'BCWG
1510 GET#1,A$:IF A$=""OR ST<>0 THEN
     1600'HPLG
1520 IF A$=F1$THEN 1790
     :REM COORDS COMING'EWFI
1530 IF A$=CHR$(134)THEN 1870
     :REM REPORT OF HIT & VALUE'FENL
1540 IF A$=CHR$(135)THEN 1910
     :REM REPORT OF MISS'FYIL
1550 IF A$<" "OR A$>"Z"THEN 1600'FIGI
1560 IF A$=CHR$(136)THEN 250'EKUI
1570 ME$=RIGHT$(ME$+A$,39)'DNWJ
1580 PRINT"[CYAN]"LEFT$(BT$,20)ME$
     :POKE 212,0'DRSM
1590 REM ***** FROM YOU TO HIM'BRTM
1600 IF MF=1 AND GV=0 AND BP=0 THEN
     GOSUB 1370:PRINT M$"[WHITE]
     YOUR TURN (F1)"'JQTM
```

```
1610 IF MF=0 AND GV=0 AND BP=0 THEN
     GOSUB 1370'INEI
1620 IF BP THEN PRINT M$"[DOWN,WHITE]
     PRESS F1 TO PLAY"'DEUI
1630 GET A$:IF GV=1 THEN 1660'EKPG
1640 IF A$=F1$AND MF=1 AND BP=0 THEN
     1760:REM GET COORDINATES'IFVP
1650 IF A$=F1$AND BP=1 THEN BP=0
     :GOTO 260:REM END INITIAL CHAT
     MODE'IJWR
1660 IF HS=0 THEN GV=1:GOSUB 1370
     :PRINT M$N$" WINS!":GOSUB 2220
     :GOTO 250'IACQ
1670 IF TS=0 THEN GV=1:GOSUB 1370
     :PRINT M$N1$" WINS!":GOSUB 2220
     :GOTO 250'IBHS
1680 IF A$>="[SHFT A]"AND A$<="
     [SHFT Z]"THEN A$=CHR$(ASC(A$)
     -128)'LPBT
1690 IF A$=CHR$(160)THEN A$=" "'FJVN
1700 IF A$<" "OR A$>"Z"THEN 1510'FIGF
1710 A1$=A$:IF A$=CHR$(34)THEN
     A1$="'"'GPFI
1720 MY$=RIGHT$(MY$+A1$,39)'DOFH
1730 PRINT"[YELLOW]"LEFT$(BT$,
     22)MY$CHR$(19)'DPFI
1740 PRINT#1,A$;:GOTO 1510'CKFH
1750 REM GET COORDINATES'BOTJ
1760 GOSUB 1370:GOSUB 1140
     :GOSUB 1370'DOSK
1770 PRINT#1,F1$CHR$(H)CHR$(V);'DMCL
1780 MF=0:GOTO 1490'CIGL
1790 REM GET OTHER COMPUTERS
     COORDINATES'BDMR
1800 GET#1,H$:IF H$=""THEN 1800'EMXF
1810 GET#1,V$:IF V$=""THEN 1810'EMCG
1820 H=ASC(H$):V=ASC(V$):MF=1
     :B=B%(V,H)'GYAM
1830 IF B=0 OR B=1 THEN PRINT#1,
     CHR$(135);:PRINT M$"[WHITE]
     "N1$" MISSED"'ISBO
1835 IF B=0 OR B=1 THEN GOSUB 2210
     :GOTO 1600'HNHQ
1840 PRINT#1,CHR$(134)CHR$(B);'DLHJ
1850 GOSUB 1250:PRINT M$"[WHITE]
     "N1$" GETS A HIT!":TS=TS-1
     :GOSUB 2210'FVVQ
1860 B%(V,H)=1:GOSUB 940
     :GOTO 1600'DRHM
1870 GET#1,B$:IF B$=""THEN 1870'EMSM
1880 B=ASC(B$):HS=HS-1'ELKO
1890 B$="[RVS]"+LEFT$(S$(B),1)+"
     [RVOFF]":GOSUB 1340'FQGR
1900 GOTO 1920'BEJD
1910 B$="*"'BCQE
1920 PRINT"[HOME]":FOR Q=1 TO V:PRINT
     :NEXT'GGKJ
1930 PRINT TAB(1+18+H)"[YELLOW]
     "B$'EHJJ
1940 GOTO 1600'BEEH
1950 REM SEND NAME TO OTHER
     COMPUTER'BXJO
1960 REM FORQ=1TO100:PRINT#1,CHR$(0);
     :NEXT'BIEQ
1970 PRINT#1,F1$;'BGCK
1980 GET#1,A$:IF A$<>F1$THEN 1970'FPNQ
1990 FOR Q=1 TO LEN(N$)
     :PRINT#1,MID$(N$,Q,1);:NEXT
     :PRINT#1,CR$;'IBRV
2000 N1$=""'BDJU
2010 GET#1,A$:IF A$>=" "AND
     A$<="Z"THEN N1$=N1$+A$'KSFF
2020 IF A$<>CHR$(13)THEN 2010'FKHB
2030 REM WHO GOES FIRST?'BNNB
2040 FOR X=1 TO 100:PRINT#1,CHR$(0);
     :NEXT'GNTE
2050 WF$=CHR$(INT(RND(0)*100)+150)
     'GQXG
2060 PRINT#1,WF$;'BGPB
2070 GET#1,A$:IF A$=""THEN 2060'EMIF
2080 IF ASC(A$)<150 OR ASC(A$)>249
     THEN 2070'HSJK
2090 IF WF$=A$THEN 2040'DJHG
2100 MF=0:MF$="SECOND":IF WF$>A$THEN
     MF=1:MF$="FIRST"'HUTH
2110 GOSUB 1370:PRINT M$"[WHITE]
     WE GO "MF$'CKFA
2120 FOR X=1 TO 100:PRINT#1,CHR$(0);
     :NEXT'GNTD
2130 RETURN'BAQX
2140 REM OTHER PLAYER READY?
     *******'BYIF
2150 PRINT#1,DS$'BFAB
2160 GET#1,A$:IF A$=DS$THEN 2180'EPRG
2170 PRINT M$"[WHITE]PLEASE WAIT..."
     :GOTO 2150'CHNI
2180 PRINT#1,CHR$(255);'CICF
2190 GET#1,A$:IF A$<>CHR$(255)THEN
     2190'GRIL
2200 RETURN'BAQV
2210 FOR DELAY=1 TO 1000:NEXT
     :RETURN'FMMC
2220 PRINT#1,CHR$(136);:GOSUB 2210
     :RETURN'EODD
2230 REM SIGNAL OTHER COMPUTER YOU
     ARE'BATH
2240 REM   READY, WAIT FOR HIS
     SIGNAL.'BXCH
2250 PRINT"[CLEAR]WAITING FOR OTHER
     PLAYER..."'BATJ
2260 PRINT#1,"[SPACE4]PUSH THE F1
     KEY. (I HAVE!) "'BCOJ
2270 PRINT#1,CHR$(7);'CGBF
2280 GET#1,A$:IF A$<>CHR$(7)THEN
     2270'GPMK
2290 FOR X=1 TO 10:PRINT#1,CHR$(7);
     :NEXT:RETURN'HNDL
```

END

Baudleship: VIC 20 version

```
120 OPEN 1,2,3,CHR$(6)
130 DIM B%(10,10)
140 POKE 36879,8:POKE 36878,0
150 BT$="[HOME,DOWN24]"
160 M$=LEFT$(BT$,16)
170 ME$="":FOR Q=1 TO 21:ME$=ME$+" "
    :NEXT
```

```
180 BL$=ME$:MY$=ME$:SV=36876
190 CR$=CHR$(13):F1$=CHR$(133):DS$="$"
200 C$(0)="[YELLOW]":C$(1)="[GREEN]"
210 PRINT CHR$(147)CHR$(142)CHR$(8)
220 S$(1)=CHR$(28)+CHR$(42)
230 FOR X=2 TO 5:READ S$(X):NEXT
240 DATA SUBMARINE,DESTROYER,CRUISER,
    BATTLESHIP
250 HS=14:TS=14:BP=1:GOTO 1230
260 GOSUB 1970:REM BOTH PLAYERS READY?
270 IF N$<>""THEN 320
280 N$="VIC":INPUT"[CLEAR,WHITE]
    YOUR NAME";N$
290 IF N$=""THEN 280
300 PRINT"[DOWN2]WAIT..."
310 GOSUB 1670
320 PRINT"[CLEAR]":P=0:GOSUB 650
330 FOR X=2 TO 5:GOSUB 1180
340 FOR J=1 TO 10:FOR K=1 TO 10
350 IF B%(J,K)=X THEN B%(J,K)=0
360 NEXT K,J
370 GOSUB 850
380 PRINT M$"[WHITE]ENTER "S$(X)"
    [SPACE3]"
390 GOSUB 1040
400 IF B%(V,H)<>0 THEN GOSUB 970
    :GOTO 340
410 GOSUB 800
420 POKE 198,0:WAIT 198,1:GET D$
430 CK=0:FOR Y=1 TO 8
440 IF MID$("TYUGJBNM",Y,1)=D$THEN 460
450 NEXT Y:GOSUB 970:GOTO 420
460 ON Y GOTO 470,480,490,500,510,520,
    530,540
470 XD=-1:YD=-1:GOTO 550
480 XD= 0:YD=-1:GOTO 550
490 XD= 1:YD=-1:GOTO 550
500 XD=-1:YD= 0:GOTO 550
510 XD= 1:YD= 0:GOTO 550
520 XD=-1:YD= 1:GOTO 550
530 XD= 0:YD= 1:GOTO 550
540 XD= 1:YD= 1:GOTO 550
550 L=1:B%(V,H)=X
560 X1=H+XD:Y1=V+YD:L=L+1
570 IF X1>10 OR Y1>10 THEN GOSUB 970
    :GOTO 340
580 IF X1<1 OR Y1<1 THEN GOSUB 970
    :GOTO 340
590 IF B%(Y1,X1)<>0 THEN GOSUB 970
    :GOTO 340
600 B%(Y1,X1)=X
610 IF L<X THEN H=X1:V=Y1:GOTO 560
620 G=0:GOSUB 900
630 NEXT X:GOSUB 850
640 GOTO 1190
650 PRINT CHR$(19)C$(P)
660 PRINT"[SPACE2,CMDR P10]"
670 PRINT"0[CMDR N,SHFT @10]"
680 PRINT"1[CMDR N,SHFT @10]"
690 PRINT"2[CMDR N,SHFT @10]"
700 PRINT"3[CMDR N,SHFT @10]"
710 PRINT"4[CMDR N,SHFT @10]"
720 PRINT"5[CMDR N,SHFT @10]"
730 PRINT"6[CMDR N,SHFT @10]"
740 PRINT"7[CMDR N,SHFT @10]"
750 PRINT"8[CMDR N,SHFT @10]"
760 PRINT"9[CMDR N,SHFT @10]"
770 PRINT"[SPACE2,CMDR Y10]"
780 PRINT"[SPACE2]ABCDEFGHIJ"
790 RETURN
800 PRINT"[HOME,SPACE10]DIRECTION?"
810 PRINT TAB(13)"[DOWN,RVS]TYU"
820 PRINT TAB(13)"[RVS]G J"
830 PRINT TAB(13)"[RVS]BNM"
840 RETURN
850 PRINT"[HOME,SPACE20]"
860 PRINT TAB(13)"[DOWN,SPACE3]"
870 PRINT TAB(13)"[SPACE3]"
880 PRINT TAB(13)"[SPACE3]"
890 RETURN
900 GOSUB 1180:PRINT"[HOME,DOWN2]";
910 FOR J=1 TO 10
920 PRINT"[RIGHT2]"TAB(G*18)
930 FOR K=1 TO 10
940 S=B%(J,K):IF S=0 THEN PRINT"
    [RIGHT]";:GOTO 960
950 PRINT CHR$(18)CHR$(5)LEFT$(S$(S),
    1)CHR$(146);
960 NEXT K:PRINT:NEXT J:RETURN
970 PRINT M$"[DOWN3,RVS]BAD ENTRY"
980 POKE SV+2,15:POKE SV,150
    :FOR DE=1 TO 80:NEXT
990 POKE SV+2,0
1000 PRINT M$"[DOWN3,SPACE11]":RETURN
1010 POKE SV+2,15:POKE SV,220
     :FOR DE=1 TO 25:NEXT
1020 FOR VO=15 TO 0 STEP-1
     :POKE SV+2,VO:NEXT:RETURN
1030 FOR Q=0 TO 24:POKE S6+Q,0:NEXT
     :RETURN
1040 PRINT LEFT$(BT$,17)"[WHITE]
     COORDINATES? (V,H)"
1050 PRINT"[SPACE4]":PRINT"[UP]";
1060 POKE 198,0:WAIT 198,1:GET V$
1070 IF ASC(V$)<48 OR ASC(V$)>57 THEN
     GOSUB 970:GOTO 1060
1080 PRINT M$"[DOWN2]"V$"-";
1090 POKE 198,0:WAIT 198,1:GET H$
1100 IF ASC(H$)<65 OR ASC(H$)>74 THEN
     GOSUB 970:GOTO 1090
1110 PRINT M$"[DOWN2,RIGHT2]"H$
1120 H=ASC(H$)-64:V=ASC(V$)-47
1130 RETURN
1140 POKE SV+2,10:FOR VO=250 TO 200
     STEP-1:POKE SV,VO:FOR DE=1 TO 8
     :NEXT DE,VO
1150 POKE 36879,42
1160 POKE SV,0:POKE SV+1,200
     :FOR VO=15 TO 0 STEP-.05
     :POKE SV+2,VO:NEXT
1170 POKE SV+1,0:POKE 36879,8:RETURN
1180 PRINT M$BL$:FOR Q=1 TO 3
     :PRINT BL$:NEXT:RETURN
1190 GOSUB 1180
1200 P=0:C$(P)="[GREEN]"
1210 GOSUB 650
```

```
1220 PRINT"[HOME,GREEN,SPACE2]";N1$
1230 GV=0:PRINT LEFT$(BT$,21);
1240 PRINT"[RED,SHFT *21]"CHR$(19)
1250 IF BP=0 THEN GOSUB 1850
     :GOSUB 1920
1260 GET#1,A$:IF A$=""OR ST<>0 THEN
     1340
1270 IF A$=F1$THEN 1520
1280 IF A$=CHR$(134)THEN 1590
1290 IF A$=CHR$(135)THEN 1630
1300 IF A$<" "OR A$>"Z"THEN 1340
1310 IF A$=CHR$(136)THEN 250
1320 ME$=RIGHT$(ME$+A$,21)
1330 PRINT"[CYAN]"LEFT$(BT$,20)ME$
     :POKE 212,0
1340 IF MF=1 AND GV=0 AND BP=0 THEN
     GOSUB 1180:PRINT M$"[WHITE]
     YOUR TURN (F1)"
1350 IF MF=0 AND GV=0 AND BP=0 THEN
     GOSUB 1180
1360 IF BP THEN PRINT M$"[WHITE,DOWN]
     PRESS F1 TO PLAY"
1370 GET A$:IF GV=1 THEN 1400
1380 IF A$=F1$AND MF=1 AND BP=0 THEN
     1490
1390 IF A$=F1$AND BP=1 THEN BP=0
     :GOTO 260:REM END INITIAL CHAT
     MODE
1400 IF HS=0 THEN GV=1:GOSUB 1180
     :PRINT M$N$" WINS!":GOSUB 1960
     :GOTO 250
1410 IF TS=0 THEN GV=1:GOSUB 1180
     :PRINT M$N1$" WINS!":GOSUB 1960
     :GOTO 250
1420 IF A$>="[SHFT A]"AND A$<="
     [SHFT Z]"THEN A$=CHR$(ASC(A$)
     -128)
1430 IF A$=CHR$(160)THEN A$=" "
1440 IF A$<" "OR A$>"Z"THEN 1260
1450 A1$=A$:IF A$=CHR$(34)THEN A1$="'"
1460 MY$=RIGHT$(MY$+A1$,21)
1470 PRINT"[YELLOW]"LEFT$(BT$,
     22)MY$CHR$(19)
1480 PRINT#1,A$;:GOTO 1260
1490 GOSUB 1180:GOSUB 1040:GOSUB 1180
1500 PRINT#1,F1$CHR$(H)CHR$(V);
1510 MF=0:GOTO 1260
1520 GET#1,H$:IF H$=""THEN 1520
1530 GET#1,V$:IF V$=""THEN 1530
1540 H=ASC(H$):V=ASC(V$):MF=1
     :B=B%(V,H)
1550 IF B=0 OR B=1 THEN PRINT#1,
     CHR$(135);:PRINT M$"[WHITE]
     "N1$" MISSED"
1555 IF B=0 OR B=1 THEN GOSUB 1910
     :GOTO 1340
1560 GOSUB 1920:PRINT#1,
     CHR$(134)CHR$(B);
1570 GOSUB 1140:PRINT M$"[WHITE]
     "N1$" GETS A HIT!":TS=TS-1
     :GOSUB 1910
1580 B%(V,H)=1:GOTO 1340
1590 GET#1,B$:IF B$=""THEN 1590
1600 B=ASC(B$):HS=HS-1
1610 B$="[RVS]"+LEFT$(S$(B),1)+"
     [RVOFF]":GOSUB 1160
1620 GOTO 1640
1630 B$="*"
1640 PRINT"[HOME]":FOR Q=1 TO V:PRINT
     :NEXT
1650 PRINT TAB(1+H)"[YELLOW]"B$
1660 GOTO 1340
1670 REM  FORQ=1TO100:PRINT#1,CHR$(0);
     :NEXT
1680 PRINT#1,F1$;
1690 GET#1,A$:IF A$<>F1$THEN 1680
1700 FOR Q=1 TO LEN(N$)
     :PRINT#1,MID$(N$,Q,1);:NEXT
     :PRINT#1,CR$;
1710 N1$=""
1720 GET#1,A$:IF A$>=" "AND
     A$<="Z"THEN N1$=N1$+A$
1730 IF A$<>CHR$(13)THEN 1720
1740 REM WHO GOES FIRST?
1750 FOR X=1 TO 100:PRINT#1,CHR$(0);
     :NEXT
1760 WF$=CHR$(INT(RND(0)*100)+150)
1770 PRINT#1,WF$;
1780 GET#1,A$:IF A$=""THEN 1770
1790 IF ASC(A$)<150 OR ASC(A$)>249
     THEN 1780
1800 IF WF$=A$THEN 1750
1810 MF=0:MF$="SECOND":IF WF$>A$THEN
     MF=1:MF$="FIRST"
1820 GOSUB 1180:PRINT M$"[WHITE]
     WE GO "MF$
1830 FOR X=1 TO 100:PRINT#1,CHR$(0);
     :NEXT
1840 RETURN
1850 PRINT#1,DS$;
1860 GET#1,A$:IF A$=DS$THEN 1880
1870 PRINT M$"[WHITE]PLEASE WAIT..."
     :GOTO 1850
1880 PRINT#1,CHR$(255);
1890 GET#1,A$:IF A$<>CHR$(255)THEN
     1890
1900 RETURN
1910 FOR DELAY=1 TO 1000:NEXT:RETURN
1920 PRINT"[HOME]"TAB(15)"[YELLOW]
     UNITS"
1930 PRINT TAB(15)"LEFT:"
1940 PRINT TAB(16)"[SPACE4,LEFT4]";TS
1950 RETURN
1960 PRINT#1,CHR$(136);:GOSUB 1910
     :RETURN
1970 REM SIGNAL OTHER COMPUTER YOU ARE
1980 REM READY, WAIT FOR HIS SIGNAL
1990 PRINT"[CLEAR,CYAN]
     WAITING FOR OTHER[SPACE5]
     PLAYER..."
2000 PRINT#1,"[SPACE3]PUSH THE F1
     KEY.[SPACE2](I HAVE!)"
2010 PRINT#1,CHR$(7);
2020 GET#1,A$:IF A$<>CHR$(7)THEN 2010
2030 FOR X=1 TO 10:PRINT#1,CHR$(7);
     :NEXT:RETURN
```

END

BY IAN ADAM

The Dirty Dozen – Twelve Ways to Faster BASIC

Commodore BASIC is a fine language. It's easy to learn, easy to use and applicable to a wide range of computing tasks. The name is an acronym for Beginner's All-Purpose Symbolic Instruction Code, and that about sums it up. In addition to its flexibility and ease of use, BASIC has other, technical advantages. It is low in cost and needs relatively little memory space to operate. These are all strong advantages for a home-computing language.

One thing BASIC is *not* noted for, however, is speed. In a word, the language is ssllooooooww. There are many cases where this is not a problem. In an interactive program, for example, the speed of BASIC is usually just fine. In fact, it often has to be deliberately slowed down with delay loops. At other times, though, waiting for BASIC can range from a nuisance to a downright embarrassment. One program I wrote recently would have required over two weeks to execute fully! But after some fairly extensive surgery and use of the tricks I'll show you here, it now runs in about 15 minutes. The results will not be this dramatic in every case, but just about any program can be speeded up with some careful attention to detail.

In large measure, BASIC's slowness is due directly to its strengths. First, because it is so flexible, it has to be very thorough about every instruction, checking and double-checking each and every detail. Of course, this is slow. Second, because it is so economical of cost and memory, BASIC simply interprets your program line-by-line as it runs. Other, more complex languages go through a two-stage RUN process. In the first stage, your program is "compiled," that is, converted to a form of machine code, before actually running. In the second stage, only machine code is run, resulting in much greater speed. Lacking this advantage, BASIC runs much more slowly.

Just about any program can be speeded up with some careful attention to detail.

Steve Early

There are several different approaches to speeding up your programming. Some of these ways are expensive or difficult. For example, you could buy a compiler. There are several excellent products available on the market that, just like more complex languages, will compile your BASIC program into a form of machine code. As a result, it can run many times faster. But they do involve a cost. Alternatively, you could buy a different, specialized language for your computer, such as FORTRAN, Pascal, LOGO or many others. Depending on the task, they may be much faster, though you may miss some of the flexibility and convenience of BASIC.

The ultimate language for speed is machine language, which feeds your instructions to the computer as a steady diet of binary ones and zeros. It's hundreds of times faster than BASIC, because binary is your computer's native language. Unfortunately, what's easy for the computer is not so great for the programmer. While machine language is fast, it's also more difficult to program and could take a long time to master.

The Easy Ways

But this article isn't about the expensive or difficult ways of speeding up your programs—it's about the easy ways. So herewith are 12 ways of speeding up BASIC, all free and all easy to use. They will cost you nothing more than some small changes in your programming habits and a little attention to details.

In order to write faster programs, you must have a clear understanding of what each step of your program is expected to achieve. It also helps to know how BASIC deals with your instructions and how long each step takes to execute. You see, some BASIC functions are much faster than others. Later on, we'll be looking at exactly how long each function takes to execute. For now, we'll settle for some fundamental rules to accelerate execution.

Let's start with something simple but surprising. Every time BASIC encounters a number in one of your program lines, it must first convert that number from the decimal form you entered it in, to the binary form that the computer "thinks" in. This operation must be completed before any further steps can be taken and it is time-consuming. Here is a very typical use of a decimal number to move a sprite on the Commodore 64:

```
FOR I = 1 TO 100 : POKE 53248,
        PEEK(53248) + 1
NEXT
```

This is an operation that could potentially be executed very quickly by BASIC, except that the repeated conversion from decimal (53248) to binary slows it down. In this example, the operation could occur almost ten times as fast if the decimal interpretation could be eliminated.

In comparison, looking up the value of a variable in memory is a relatively fast operation. This immediately makes obvious our first speed trick—if a constant is to be used repeatedly, define it as a variable at the start of the program. This could be critical with, for example, any program that uses repeated pokes to set up a graphics or sound display.

Using our example above, the revised code would be:

```
X = 53248 : A = PEEK( X )
FOR I = A + 1 TO A + 100: POKE
    X, I :NEXT
```

This will operate many times faster than the first version; the difference in graphics animation would be stunning.

A little experimentation will reveal the reason for the second trick. BASIC stores your variables in memory in the same order they were defined. As a result, it can find or store the first variable defined a lot faster than the tenth or twentieth variable. For maximum speed, the most frequently used variables should always be defined first.

Now that you get the gist of what we're doing, here are all 12 tricks. Most of them are self-explanatory. Take the time to study them and understand how they work. Try using them in a program you find to be too slow. With just a little effort, surprising results can usually be achieved.

The Dirty Dozen

1. Retrieving a variable is much faster than interpreting a decimal number. If a constant is to be used frequently throughout a program, define it as a variable instead. The larger or more complex the number, the greater the savings—up to ten or 20 times as fast. Where a variable is to be set to zero, the fastest method is to use the decimal point (as in X = .).

2. Define variables in order, from most-used to least-used. The first variable defined can be handled much faster than subsequent variables. Variables may be defined by a DIM statement (even for non-array variables), or simply by giving them values. Where part of a program is executed repeatedly, such as the main control loop of a game using graphics, it is a worthwhile exercise to simply count how many times each variable is used and multiply by the number of times each line will be executed. All types of variables are listed together (i.e., integer, floating point and string), so you must consider all types when deciding in what order to define them. Array variables are listed separately from non-arrays, however.

Try using these 12 tricks in a program you find to be too slow. With just a little effort, surprising results can usually be achieved.

3. Avoid higher math functions if at all possible. Obviously there are many cases where this is not possible, but if it is, the time savings are considerable. Where certain math functions must be used repeatedly inside a loop, it may be faster to calculate the values first and pass them into the loop as variables.

4. Avoid array variables like the plague. As with trick number three, there are many cases where array variables are an essential element of programming. In other cases, however, they are used just as a convenience. It should be recognized that they are very slow. Simply finding the variable can take three to five times as long as finding a simple variable and still more time is required to interpret the subscript. The total access time can easily be up to 20 times as high as for a simple variable.

5. When printing, use one long string rather than printing a series of small strings separately. Avoid scrolling the screen—a slow function. It is much faster to clear the screen and start over. TAB is quite slow, too, since it repeatedly prints cursor right, instead of jumping to the destination.

6. Clear program structure is as important to the computer as to the reader. A program that jumps about circuitously from line to line will generally run slowly. Examine program structure carefully to see whether it can be simplified; place frequently-used parts at the front.

7. Crunch the BASIC code. Compact code is fast code and there are many ways to achieve this. Put multiple statements on one line, for example. Spaces between keywords are not necessary in Commodore BASIC (unlike some others) and should be removed. As BASIC recognizes only the first two characters of a variable name, any longer names are redundant and should be truncated.

Minimize REMarks. Although REM itself uses little time, each character in the remark adds time as the computer searches for the end of the line. It is common to start a section of a program or a subroutine with a line containing only a REMark. In this case, a GOTO or GOSUB can point to the second line of the program section, by-passing the REM entirely.

8. Minimize GOTO's and GOSUB's and choose them carefully. Although these commands are reasonably fast, their argument must be translated from a decimal to a binary integer. Commodore BASIC uses a different method of conversion that is faster than for other numbers, but it still takes time, as does searching for the target line.

A useful feature of Commodore BASIC is that it will begin searching for a line number at one of two different places. The line number is stored as a two-byte integer and is compared to the number of each line in succession. If the target line number is higher than the present line number, BASIC will begin searching immediately. If the target line is equal to or lower than the current line number, then it will begin searching at the beginning of the program.

Does this sound confusing? It isn't really. Say you are in line 1000. A small jump forward, such as GOTO 1020, will be very quick. If, however, the instruction is GOTO 990, then BASIC will go right back to the start of the program to begin searching for line 990. This may take some time, particularly if there are a lot of intervening lines. The moral is, limit yourself to small jumps forward, or else jump to near the beginning of the program. This is the reason for placing frequently-used subroutines near the front of the program with low line numbers, so they can be found easily.

9. GOSUB is faster than GOTO if you will be coming back to the same location in the program later. This is because the RETURN instruction is

extremely fast. The location is stored in binary and is jumped to immediately. No searching is necessary.

In a similar manner, a FOR...NEXT loop can be a very fast way to carry out multiple calculations. It is certainly much faster than a structure involving a whole series of tests and conditional GOTO's. The same reason for this prevails—the location of the start of the loop is stored in binary. When NEXT is encountered, all necessary tests are performed in machine code and the jump to the start of the loop is made immediately. All decimal constants are converted to binary only once at the start of the loop, thus saving conversion time on each iteration.

10. IF...THEN is one of the fastest BASIC functions, but even it can be helped along sometimes. One common example is this:

```
IF A=5 AND B+C<12 THEN ...
```

This statement can be made to execute much faster—sometimes two to three times faster—if it is expressed like this:

```
IF A=5 THEN IF B+C<12
        THEN
```

This is an inherently faster series of commands. The real savings, however, are gained if A does not equal five. In that case, BASIC simply ignores everything else in the statement.

Another improvement can be obtained from the much-ignored ON statement. This simple command can replace a whole series of IF ... THEN statements with one fast, easy line.

11. One function that can often be avoided is RaNDom. If you just want a value that varies from time to time and doesn't have to be truly random, you can get one from the jiffy clock. This is a set of three registers that is updated 60 times every second and is used to generate TI and TI$. PEEK (162) will yield a random value from zero to 255 on the VIC 20 and 64.

Another source of a random number on the 64 is the sound chip. Voice three can be set to white noise with POKE 54287, 255 : POKE 54290, 129. The output is silenced with POKE 54296, 143. A pseudo-random number can then be obtained by reading the output of this voice, using PEEK (54299). This is more work, but it behaves in a more random manner than the jiffy clock.

> *A choice you will have to make—is it more important for your particular program to be fast or to be readable?*

12. If your computer has special graphics modes that you aren't using, turn them off. The video chip has special privileges, sort of "visiting rights" on the memory bus. Known as Direct Memory Access (or DMA), this allows the chip to halt the central processor while it looks up information on the screen display, character ROM, etc. While this is in progress, no calculating can be done.

On the VIC 20 and Commodore 64, the video screen can be turned off completely. There is some danger in this, of course. If your program encounters an error and stops running, you will not be aware of this if the screen is blanked. However, if you have confidence in your program, blanking the screen is a viable way to improve operating time. For the 64, the screen display adds six to seven percent to the running time and sprites add up to another five percent. (On some other well known home computers, graphics modes can add 50 percent or more!)

Here are the necessary commands for the 64:

POKE 53265,11	... turns screen off, for a time saving of 6-½%.
POKE 53265,27	... return to normal text screen.
POKE 53269,0	... turns off all sprites, for a further saving of up to 5%.

For the VIC 20 or other machines, consult your users' manual for special requirements.

If you are really adventurous, you could carry this concept a step further and turn off the normal hardware interrupt. However, this is a job best left to experts, who don't mind crashing their machines.

13. Finally, when all else fails, you can always insert a machine-language subroutine. You don't necessarily have to know machine language to do this. A number of interesting subroutines have been published, in this journal and elsewhere, to carry out various time-consuming tasks. All that's necessary is to poke the specified data into memory and access it with a SYS call. And remember ... Commodore BASIC allows you to use a variable for the address, as in:

```
MC = 49152
FOR I = 1 TO 100 : SYS MC :
        NEXT
```

Application

Well, I promised you a dozen dirty tricks, but it ended up being a baker's dozen. No charge for the extra one! Try to keep them in mind next time you want to speed up a program.

Some parts of a program may not warrant much attention. Instructions, for example, or housekeeping chores that are carried out only occasionally, do not use much time nor offer much potential for savings. What most programs do have, however, is a main loop, an area or areas where statements are repeatedly executed, perhaps thousands of times. Whether this loop is the graphics display of a game program or the repeated calculations of balance outstanding on a mortgage, this is where you should concentrate your efforts.

Remember, too, that you can combine various hints for best effect. For example, suppose you frequently need an integer from zero to 15 in your program. The usual coding would be:

```
X = INT ( RND ( - TI ) * 15 )
```

Remembering trick number one, define the constants first:

```
JC = 162 : FT = 15
```

Then, when you need a "random" number, just use trick eleven:

```
X = PEEK ( JC ) AND FT
```

And please...leave out the spaces!

One interesting point to note: A program that is written to be fast may not be very readable. Leaving out REM's and spaces, changing the structure of the program and using obscure peeks and pokes all tend to make a program hard to read or edit. That, however, is just a choice you will have to make—is it more important for your particular program to be fast or to be readable? ◼

BY JERRY AND BETTY SCHUELER

Sprite Definition Form

Probably the hardest part of programming your own sprites is working up the data for the sprite definition. To make this task easier, many people use public domain or commercial sprite-maker programs. These programs are easy to use and will do much of the work for you. However, they work only if you have access to a computer—and in multi-user families, computer access time is often limited.

For instance, in our extended family, we often have two or more people wanting to use a computer at the same time. One person may need to type up a term paper, another may need to test a computer program for school, while someone else may want to design a sprite. To make sure everyone has an equal opportunity to use the computers, we insist that all preliminary work be done in advance. Although this means a little more work on everyone's part, we find that in the long run, it teaches better work habits and respect for the privilege of using the computers.

One thing we have done to make this preliminary work a little easier—and to help teach the fundamentals of sprite making—is to devise a form (on paper) that all of us use when defining our sprites. The form is easy to use even for inexperienced programmers. We have found that, with only a little practice, it will work almost as fast as a sprite-maker program.

As you can see in Figure 1, the sprite design grid consists of 504 squares. There are 24 columns arranged in three sections of eight columns each and there are 21 rows. The column sections are titled Section A, Section B and Section C. Each section holds eight squares. Each square represents one bit of data. A bit represents a binary number and can have only two values: on or off, or in this case, empty or full. Eight bits make one byte, so each section on each row represents one byte of data.

The grid begins with all squares clear or empty. In order to define a sprite, simply fill in the squares that you want. The example sprite in Figure 1 was constructed to look like a U.F.O. The filled-in squares will appear on the screen. The empty squares will contain the background color. In this example, the empty squares in Section B of Row 5 represent windows or ports along the middle of the spaceship. Don't worry about the rough uneven appearance of lines made by the squares. These will look curved on the screen when reduced to the actual size of the sprite.

After drawing your sprite in the grid by filling in the appropriate squares, you will need to calculate the numbers used in the data statements of your program. Because each section of each row represents one byte, each group of eight squares must be reduced to a single byte of data. The five columns on the right side of the design grid are to help you go from your sprite drawing to the data statements of your program. Under the column headed BASIC LINE, enter the line number of your program where the corresponding three bytes of data will go. The BASIC statement, DATA, has already been added in each row for your convenience.

The column headed SUM OF A is where you will place the byte of data obtained from Section A, for each row. Similarly, SUM OF B is for data from Section B and SUM OF C is for data from Section C.

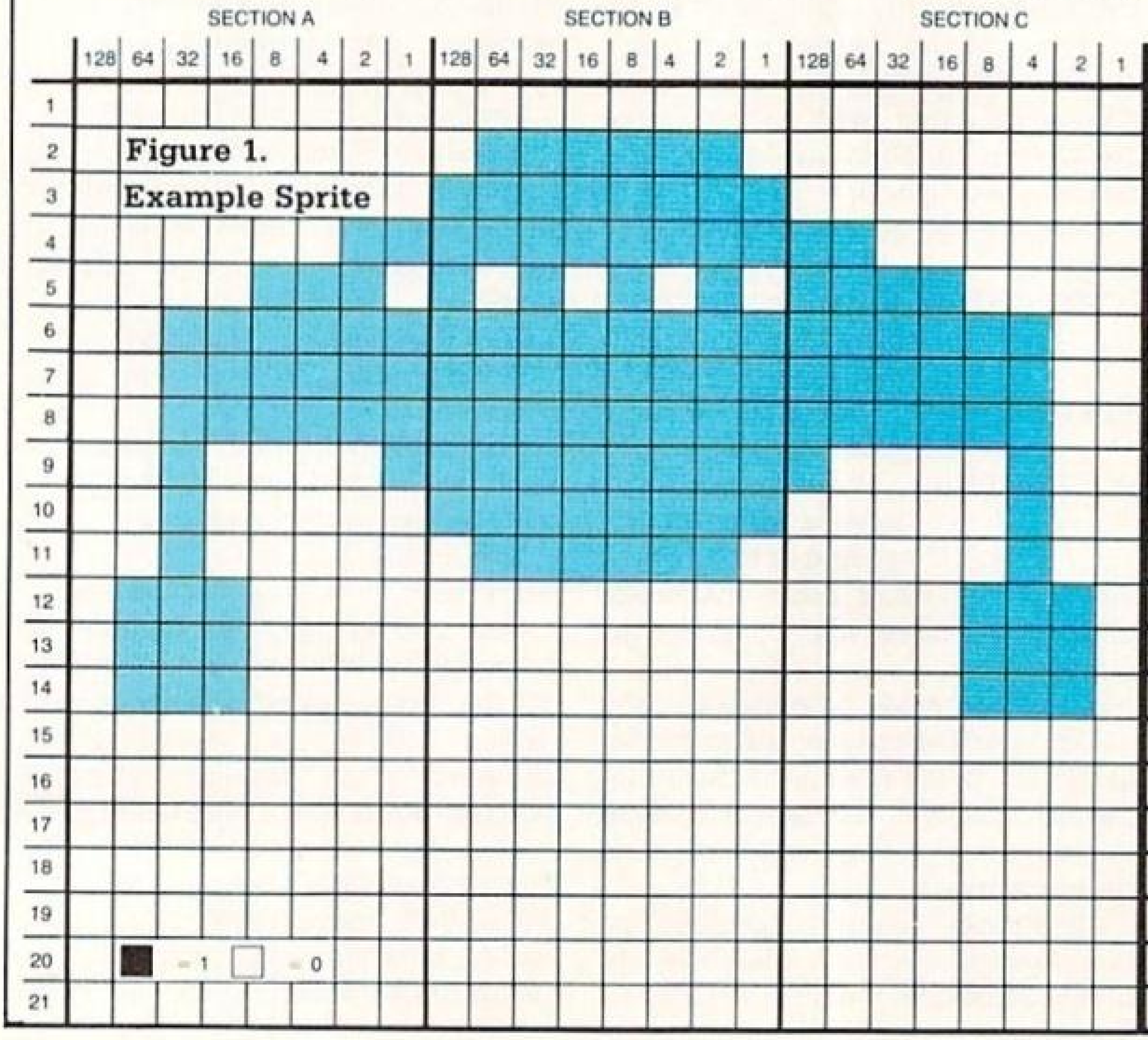


Figure 1. Example Sprite

BASIC LINE	DATA	SUM OF A	SUM OF B	SUM OF C
100	DATA	0	0	0
110	DATA	0	126	0
120	DATA	0	255	0
130	DATA	3	255	192
140	DATA	14	170	240
150	DATA	63	255	252
160	DATA	63	255	252
170	DATA	63	255	252
180	DATA	33	255	132
190	DATA	32	255	4
200	DATA	32	126	4
210	DATA	112	0	14
220	DATA	112	0	14
230	DATA	112	0	14
240	DATA	0	0	0
250	DATA	0	0	0
260	DATA	0	0	0
270	DATA	0	0	0
280	DATA	0	0	0
290	DATA	0	0	0
300	DATA	0	0	0

Look at Row 1 of the example in Figure 1. The entire row consists of empty squares. Each empty square counts as a zero, which makes our calculations easy because any number multiplied by zero is a zero. The rule to follow here is this: The value of each square (zero if empty or one if filled) is multiplied by the number above each column (i.e., either 128, 64, 32, 16, 8, 4, 2 or 1). The value of the byte is then calculated by adding up the eight products of the previous multiplications. For each section of each row, multiply the value of the first square (zero or one) by 128. Then multiply the value of the second square (zero or one) by 64 and so on for all eight squares. Then add up the eight products and place the sum in the corresponding block on the right side of the grid.

In order to make sure you understand this process, look at Row 5. In Section A of Row 5, we have the following:

$128 \times 0 = 0$
$64 \times 0 = 0$
$32 \times 0 = 0$
$16 \times 0 = 0$
$8 \times 1 = 8$
$4 \times 1 = 4$
$2 \times 1 = 2$
$1 \times 0 = 0$

Sum of Section A, Row 5 = 14

The value of the byte is calculated to be 14. This number is then inserted under the column titled SUM OF A in Row 5. The next byte (Row 5, Section B) is found by:

$128 \times 1 = 128$
$64 \times 0 = 0$
$32 \times 1 = 32$
$16 \times 0 = 0$
$8 \times 1 = 8$
$4 \times 0 = 0$
$2 \times 1 = 2$
$1 \times 0 = 0$

Sum of Section B, Row 5 = 170

The value of this byte of data is 170. This is placed under the column heading SUM OF B for Row 5. The value for Section C of Row 5 is found the same way:

$128 \times 1 = 128$
$64 \times 1 = 64$
$32 \times 1 = 32$
$16 \times 1 = 16$
$8 \times 0 = 0$
$4 \times 0 = 0$
$2 \times 0 = 0$
$1 \times 0 = 0$

Sum of Section C, Row 5 = 240

This value is placed under SUM OF C. In the same way, all 63 bytes of the sprite must be calculated. When you are finished as shown in the example, you will be ready to program your sprite. Just type the line numbers directly from the sprite design grid into your program. C

PAINLESS COMPUTING

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COMPUTER TUTOR

BY LARRY GREENLEY, COMMODORE SENIOR TECHNICAL WRITER

Introduction to SOUND on the Commodore 128

The Commodore 128 has one of the most sophisticated built-in sound synthesizers available in a microcomputer. The synthesizer, called the Sound Interface Device (SID), is a single chip dedicated solely to generating sound and music. The SID chip is capable of producing three independent voices (sounds) simultaneously. Each of the voices can be played in one of four types of sounds, called waveforms. The SID chip also has programmable Attack, Decay, Sustain and Release (ADSR) parameters for each waveform. These parameters define the quality of a sound. In addition, the synthesizer has a filter you can use to choose certain sounds, eliminate others, and modify the characteristics of a sound.

To make it easy for you to select and manipulate the many capabilities of the SID chip, Commodore has incorporated new and powerful BASIC sound and music statements into the 128's 7.0 BASIC. This article concentrates on the new SOUND command. SOUND is designed for creating fast and easy sound effects in your own BASIC programs.

The SOUND Statement Format

The format for the SOUND statement is as follows: SOUND VC, FREQ, DUR [,DIR] [,MIN] [,SV] [,WF] [,PW] Here's what the parameters stand for:

VC — Select voice 1, 2 or 3
FREQ — Set the frequency level of sound (0-65535)
DUR — Set duration of the sound (in sixtieths of a second)
DIR — Set the direction in which the sound is incremented/decremented
  0 = Increment the frequency upward
  1 = Decrement the frequency downward
  2 = Oscillate the frequency up and down
MIN — Select the minimum frequency (0-65535) if the sweep (DIR) is specified
SV — Choose the step value for the sweep (0-32767)
WF — Select the waveform (0-3)
  0 = Triangle
  1 = Sawtooth
  2 = Variable Pulse
  3 = White Noise
PW — Set the pulse width, the width of the variable-pulse waveform

> *You can produce interesting sound effects with the Commodore 128's SOUND statement, using up to three voices.*

The DIR, MIN, SV, WF and PW parameters appearing in brackets are optional.

The first parameter (VC) in the SOUND statement selects which voice will be played. The second parameter (FREQ) determines the frequency of the sound, which ranges from zero through 65535. The third setting (DUR) specifies the amount of time the sound is played. The duration is measure in sixtieths of a second. If you want to play a sound for one second, set the duration to 60, since 60 times 1/60 equals one. To play the sound ten seconds, make the duration 600, and so on.

The fourth parameter (DIR) selects the direction in which the frequency of the sound is incremented or decremented. This is referred to as the sweep. The fifth setting (MIN) sets the minimum frequency where the sweep begins. The sixth setting (SV) is the step value of the sweep. It is similar to the step value in a FOR-...NEXT loop. If the DIR, MIN and SV values are specified in the SOUND command, the sound is first played at the original level specified by the FREQ parameter. Then the synthesizer sweeps through and plays each level of the entire range of frequency values according to the step value, starting at the MIN frequency. The sweep is incremented or decremented by the step value (SV) according to the direction specified by the DIR parameter.

The seventh parameter (WF) selects the waveform for the sound. The final setting in the SOUND command determines the width of the variable-pulse waveform if it is selected as the waveform parameter.

Now try these example SOUND commands.

```
SOUND 1, 4096, 60
```

The Commodore 128 plays a short, high-pitched beep. The computer is playing voice one at a frequency of 4096 for a duration of one second (60 times 1/60).

Change the frequency with this statement:

```
SOUND 1, 8192, 60
```

Notice that this second example plays a higher tone than the last one. As you increase the frequency setting, the Commodore 128 increases the pitch of the tone.

Now place the SOUND statement within a FOR...NEXT loop. This allows you to play the complete range of frequencies within the loop. Add these statements to your program:

```
50 FOR I = 1 TO 65535 STEP 100
60 SOUND 1, I, 1
70 NEXT
```

This program segment plays the variable-pulse waveform in the range of frequencies from one through 65535 in increments of 100, from lowest frequency to highest. If you don't specify the waveform, the computer selects the default value of voice one, the variable-pulse waveform.

Now change the waveform with the following program line (60) and try the program again:

```
60 SOUND 1, I, 1, 0, 0, 0, 0, 0
```

Now the program plays voice one using the triangle waveform, for the range of frequencies between one and 65535 in increments of 100. This sounds like a typical sound effect in popular arcade games. Try waveform one, the sawtooth waveform, and see how it sounds with this line:

```
60 SOUND 1, I, 1, 0, 0, 0, 1, 0
```

The sawtooth waveform sounds similar to the triangle waveform, although it has less buzz. Finally, try the white noise waveform (3). Substitute this line for line 60:

```
60 SOUND 1, I, 1, 0, 0, 0, 3, 0
```

Now the program loop plays the white-noise generator for the entire range of frequencies. At first, there is a low-pitched rumbling sound. As the frequency increases in the loop, the pitch increases, which sounds like a rocket taking off.

So far we have not specified all of the parameters in the SOUND statement. In line 60 for example, the three zeros following 1, I, 1 pertain to the sweep parameters within the SOUND statement. Since none of the parameters is specified, the SOUND does not sweep. Add this line to your program:

```
100 SOUND 1, 49152, 240, 1, 0,
    100, 1, 0
```

Line 100 starts the sweep frequency at 49152 and decrements the sweep by 100 in the downward direction until it reaches the minimum sweep frequency at zero. Voice one, using the sawtooth waveform (1), plays each SOUND for four seconds (240 * 1/60 second). Line 100 sounds like a bomb dropping, as in many "shoot 'em up" arcade games.

Now change the parameters in line 100. For instance, change the direction of the sweep to two (oscillate), change the minimum frequency of the sweep to 32768, and increase the step value to 3000. The new SOUND command looks like this:

```
110 SOUND 1, 49152, 240, 2,
    32768, 3000, 1
```

Line 110 makes a siren sound—you know the sound I mean, when you look in your rear-view mirror and realize the police are right on your tail. For a more pleasant sound, try this:

```
110 SOUND 1, 65535, 250, 0,
    32768, 3000, 2, 2600
```

This should remind you of a popular space-age TV show, when our favorite space-exploration crew checks the "dry quarter reading" on the alien planet.

Experiment further with the SOUND statement. Until now, you have been programming in only one voice. You can produce interesting sound effects with the SOUND statement using up to three voices. Listing 1 is a fun program that uses three voices. Type it into your computer and RUN it. Press the STOP key to stop the program.

The program in Listing 2 will help you understand how to program the Commodore 128 synthesizer chip. The program asks for each SOUND parameter and plays the sound. Type it into your computer, save and run it.

Here's a quick explanation of the program in Listing 2. Lines 20 and 30 print the introductory messages on the screen. Lines 40 through 60 input the voice, frequency and duration parameters. Line 70 asks if you want to enter the optional SOUND parameters, such as the sweep settings and waveform. If you don't want to specify these parameters, press the "N" key and the program jumps to line 140 and plays the sound. If you do want to specify the optional SOUND settings, press the "Y" key and the program continues with line 90. Lines 90

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through 120 specify the sweep direction, minimum sweep frequency, sweep step value and waveform. Line 130 inputs the pulse width of the variable-pulse waveform only if waveform two (variable-pulse) is selected. Finally, line 140 plays the SOUND according to the parameters that you specified earlier in the program.

Line 150 asks if you want to hear the SOUND again. If you do, press the "Y" key; otherwise, press the "N" key. Line 160 checks to see if you pressed the "Y" key. If you did, program control is returned to line 140 and the program plays the SOUND again. If you do not press the "Y" key, the program continues with line 170, which returns program control to line 20 and the program repeats. To stop the Sound Player program, press the RUN/STOP and RESTORE keys at the same time.

Random Sounds

The program in Listing 3 generates random sounds using the RND function. Each SOUND parameter is calculated randomly. Type the program into your computer, save it and run it. This program illustrates how many thousands of sounds you can produce by specifying various combinations of the SOUND parameters.

Lines 20 and 30 print parameter column headings and the underline. Lines 40 through 110 calculate each SOUND parameter within its specific range. For example, line 40 calculates the voice number as follows:

```
40 V = INT(RND(1)*3)+1
```

The notation RND(1) specifies the seed value of the random number. The seed is the base number generated by the computer. The "1" tells the computer to generate a new seed each time the command is encountered. Since the Commodore 128 has three voices, the line tells the computer to generate a random number within the range zero through three. Notice however, that there is no voice zero, so the "+1" in line 40 tells the computer to generate a random number in the range between one and three. The procedure for generating a random number in a specific range is to multiply the seed value times the maximum value of the parameter (in this case, three). If the minimum value of the parameter is greater than zero, add the random number to a value that specifies the minimum value of the range of numbers you want to generate (in this case, one). For instance, line 50 generates a random number in the range between zero and 65535. Since the minimum value is zero in this case, you do not need to add a value to the seed.

Line 120 prints the values of the parameters. Line 130 plays the sound specified by the random numbers generated in lines 40 through 110. Line 140 delays the program for four seconds while the sound is playing. Line 150 turns off the sound after the four-second delay. All sounds generated by this program play for the same amount of time, since they are all turned off after four seconds with line 150. Finally, line 160 returns control to line 20, and the process is repeated until you press the RUN/STOP and RESTORE keys at the same time.

So far you have experimented with sample programs using only the SOUND statement. Although you can use the SOUND statement to play musical scores, it is best suited for quick and easy sound effects like the ones in the above examples. The Commodore 128 has other statements designed specifically for song playing. Upcoming issues will describe the advanced sound and music statements that enable you to play complex musical scores and arrangements with your Commodore 128 synthesizer. ■

Listing 1. Three Voices

```
100 SOUND 1,49152,250,1, 0,100, 1,1000
110 SOUND 2,49152,250,2, 32768,3000 , 1
150 SOUND 3,32768,250,2, 32768,3000 , 2, 2600
200 SOUND 1,65500,180,0,1000,100,3
205 SOUND 2,49152,250,1, 0,100, 1,1000
250 SOUND 3,32768,250,2, 32768,3000 , 2, 2600
```

END

Listing 2. Sound Player

```
10 REM SOUND PLAYER
20 PRINT:PRINT:PRINT:PRINT"]                SOUND PLAYER":
   PRINT:PRINT:PRINT
30 PRINT"     INPUT SOUND PARAMETERS TO PLAY":PRINT:PRINT
40 INPUT "VOICE (1-3)";V
50 INPUT "FREQUENCY (0-65535)";F
60 INPUT "DURATION (0-32767)";D:PRINT
70 INPUT"WANT TO SPECIFY OPTIONAL PARAMETERS Y/N";B$:PRINT
80 IF B$="N" THEN 140
90 INPUT "SWEEP DIRECTION 0=UP,1=DOWN,2=OSCILL";DIR
100 INPUT "MINIMUM SWEEP FREQUENCY (0-65535)";M
110 INPUT "SWEEP STEP VALUE (0-32767)";S
120 INPUT "WAVEFORM (0=TRI,1=SAW,2=VAR PUL,3=NOISE";W
130 IF W=2 THEN INPUT "PULSE WIDTH (0-4095)";P
140 SOUND V, F, D, DIR, M, S, W, P
150 INPUT"DO YOU WANT TO HEAR THE SOUND AGAIN Y/N";A$
160 IF A$="Y"THEN 140
170 GOTO20
```

END

Listing 3. Random Sounds

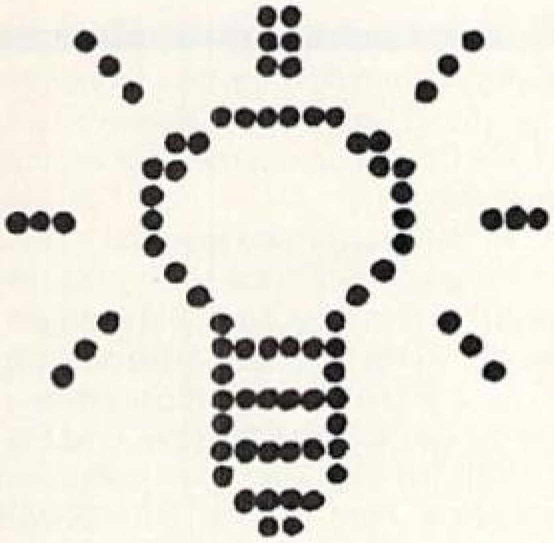
```
10 REM RANDOM SOUNDS
20 PRINT"VC  FREQ  DIR  MIN   SV   WF   PW "
30 PRINT"______________________________________________"
40 V=INT(RND(1)*3)+1:REM VOICE
50 F=INT(RND(1)*65535)   :REM FREQ
60 D=INT(RND(1)*32767)   :REM DURATION
70 DIR=INT(RND(1)*3)   :REM STEP DIR
80 M=INT(RND(1)*65535)   :REM MIN FREQ
90 S=INT(RND(1)*32767)   :REM STEP VAL
100 W=INT(RND(1)*4)   :REM WAVEFORM
110 P=INT(RND(1)*4095)   :REM PULSE W
120 PRINTV; F;DIR;M;S;W;P:PRINT:PRINT
130 SOUND V, F, D, DIR, M, S, W, P
140 SLEEP 4
150 SOUND V, 0, 0, DIR, 0, 0, W, P
160 GOTO20
```

END

SPRITES

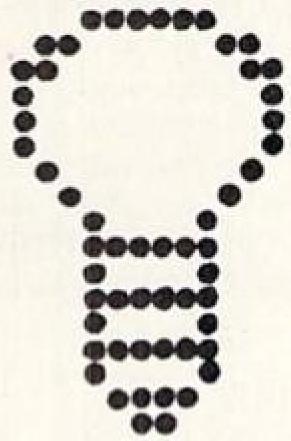
In the February/March issue we ran a program titled "Sprite Catalog" that lets you create a library of sprites, so you don't need to reinvent the wheel everytime you need to use a sprite in a program. We also challenged our readers to submit their best sprites to us to help fellow computerists build their sprite libraries. To add to your collection, here are six sprites produced by "Sprite Catalog" author Andy Gamble, with the data you need to type into your "Sprite Catalog" program. They're all yours.

LIGHTBULBON



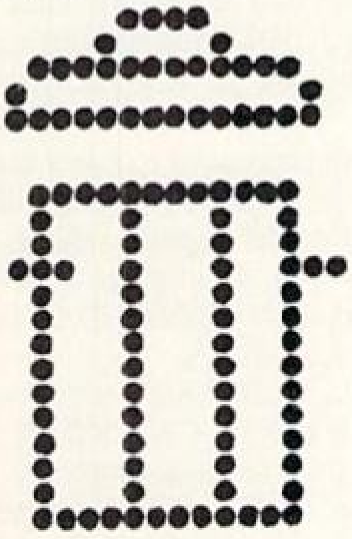
```
0   24   0
16   24   8
8   24   16
4   0   32
0   126   0
1   129   128
3   0   192
2   0   64
226   0   71
2   0   64
1   0   128
0   129   0
8   66   16
16   126   8
32   66   4
0   126   0
0   66   0
0   126   0
0   66   0
0   60   0
0   24   0
```

LIGHTBULBOFF



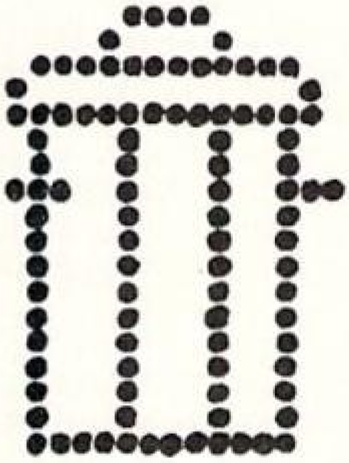
```
0   0   0
0   0   0
0   0   0
0   0   0
0   126   0
1   129   128
3   0   192
2   0   64
2   0   64
2   0   64
1   0   128
0   129   0
0   66   0
0   126   0
0   66   0
0   126   0
0   66   0
0   126   0
0   66   0
0   60   0
0   24   0
```

GARBAGECANOPEN



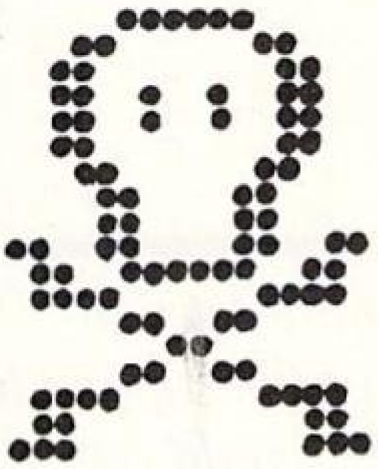
```
0   120   0
0   132   0
7   255   128
8   0   64
15   255   192
0   0   0
0   0   0
7   255   128
4   68   128
4   68   128
14   68   224
4   68   128
4   68   128
4   68   128
4   68   128
4   68   128
4   68   128
4   68   128
4   68   128
4   68   128
7   255   128
```

GARBAGECANCLOSED



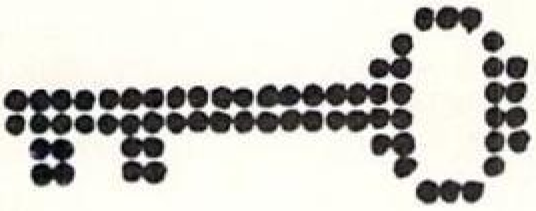
```
0   0   0
0   0   0
0   0   0
0   120   0
0   132   0
7   255   128
8   0   64
15   255   192
4   68   128
4   68   128
14   68   224
4   68   128
4   68   128
4   68   128
4   68   128
4   68   128
4   68   128
4   68   128
4   68   128
4   68   128
7   255   128
```

SKULL&X-BONES



```
0   0   0
0   0   0
0   126   0
1   129   128
3   0   192
3   36   192
3   36   192
3   0   192
1   129   128
0   195   0
0   195   0
12   195   48
6   126   96
7   129   224
0   102   0
0   24   0
0   102   0
7   129   224
6   0   96
14   0   112
0   0   0
```

KEY



```
0   0   0
0   0   0
0   0   0
0   0   0
0   0   56
0   0   68
0   0   198
255   255   198
255   255   198
102   0   198
102   0   68
0   0   56
0   0   0
0   0   0
0   0   0
0   0   0
0   0   0
0   0   0
0   0   0
0   0   0
0   0   0
```

NO MORE PENCILS

BY DAVID MALMBERG

List Processing in LOGO, Part 3

A LOGO Data Base for the Commodore 64 and Plus/4

Let us continue the exploration of list processing in LOGO that has occupied this column in the last two issues of *Power/Play*. This month we will conclude our discussion of lists with a relatively sophisticated application of LOGO list manipulation—specifically, an "intelligent" data base with simple-to-use query capabilities. Quite independently of the LOGO usage, we will become acquainted with the elementary use and power of database packages.

Our LOGO data base, which is shown in Listing 1, is patterned after the commercial product *PFS:File*. Versions of *PFS:File* have been published for a number of microcomputers. It is one of the most popular data bases available.

Our LOGO data base emulates *PFS:File*'s simplicity. At the same time, it tries to encompass 95% of the capabilities any database user would ever need, which includes creating record layouts, adding or deleting records, sorting records, automatically calculating totals for numeric fields, displaying or printing either all records or just selected records based on various logical search criteria, and saving to and retrieving from disk.

> *Our LOGO data base tries to encompass 95% of the capabilities any database user would ever need.*

Our LOGO data base, unfortunately, is limited in terms of its speed and the number of records it can handle. On the Commodore 64, the data base will handle about 25 records—fewer if the individual records have a large number of fields. LOGO on the Plus/4 has a larger workspace so it can handle two to three times the number of records that the 64 version can. Due to these limitations, you should not consider this LOGO program as a "professional" data base but rather an excellent example of how data bases work and how LOGO's list-processing capabilities can be used to deal with serious, relatively complex applications.

Using the LOGO Data Base

After loading the LOGO language into your Commodore 64 or Plus/4, enter the database program shown in Listing 1 and save the program on disk. Whenever you wish to develop a new data base, begin by using this original disk copy of the program. By following this procedure and beginning with a "fresh" copy of the program, you will insure that you have the maximum memory to store records in your data bases.

> *The real power of a data base is its ability to organize data for the user and to display it in a more meaningful form.*

Once you have a copy of the database program loaded into LOGO, the first thing you will want to do is define the fields for each record of your data base. For example, let's assume you want to create a data base to keep track of your calendar of activities and appointments. You do that by giving the command: CREATE "CALENDAR [DATE TIME PERSON-EVENT]. This command would define a new data base named CALENDAR which has an index consisting of three fields: DATE, TIME, and PERSON-EVENT. The dash between PERSON and EVENT is necessary to make it a single field rather than a PERSON field and a separate EVENT field. In addition to the index fields, each record will also have a free-form ENTRY field—which in the case of your CALENDAR, would be used to store a few words of explanation about each appointment or event.

To add records to this data base, you give the command: ADD "CALENDAR. The computer then prompts you to enter the DATE for the first appointment, followed by its TIME, followed by the PERSON-EVENT. Finally, you are prompted to enter the ENTRY for this record. An entire record might be entered as follows:

```
DATE? 85-10-15
TIME? 8:30PM
PERSON-EVENT? JOHN-DOE
ENTRY? SURPRISE BIRTHDAY PARTY
```

LOGO is expecting a word (a contiguous string of characters) as the response to each of the index field prompts. Spaces are not allowed in a word. That is why the dash is used between JOHN and DOE. In contrast, the ENTRY prompt expects a list of words so spaces are allowed in this response.

You would continue to be prompted to enter additional records until you responded with QUIT to the ENTRY? prompt. At that point, you could display records on the video screen and/or the printer, save your data base to disk, or give the command ADD "CALENDAR to enter more appointments.

To display all the records you have entered, you give the command: DISPLAY EVERY "CALENDAR. When the records are displayed, they are automatically shown in sorted order—regardless of the order in which they were entered. The display order is determined by the sequence and entry values of the various index fields. For example, your calendar would show appointments in DATE order and in TIME order for any given date. If you happened to have more than one appointment at the same time on the same date, the third index field, PERSON-EVENT, would be used to display them in alphabetical order.

If your data base has numeric index fields, the LOGO database program automatically calculates totals for these fields for all the records displayed. This feature is particularly helpful when using the data base to examine expenses or income by various categories, such as your medical expenses or Sally Johnson's sales of Girl Scout cookies during February.

You can print your database records on your printer in addition to the video screen by giving the LOGO command PRINTER. To turn off the printer option, use the LOGO command NOPRINTER. To save your records to disk, give the command SAVE "CALENDAR. Your records can be retrieved from disk later by READ "CALENDAR. Your database records are saved complete with a copy of the database program, so you will not need to reload the database program before you READ your data back into LOGO.

Querying the Data Base

The real power of a data base is its ability to organize data for the user and to display it in a more meaningful form. Sorting is a good example of this power, but an even better demonstration is the ability to interrogate the data base and to display records that have certain attributes or characteristics.

For instance, using a data base of business expenses, we might wish to display all the records for expenses greater than a certain amount that occurred before the end of our tax year, or to display the total amount of all of our software expenses, or each of our repair expenses for a particular car since April and their total.

Or, for more personal examples, we might wish to query a name and address data base to see who in the PTA we sent Christmas cards to last year, or to find the telephone numbers for the people on the soccer team, or the addresses of the other members of our Commodore Computer User Group who have a special interest in LOGO. These are all examples of special database queries.

Our LOGO data base has a number of query capabilities. To display only selected records, i.e., only records with certain attributes, give the command: DISPLAY SELECTED "NAME where NAME is the name of the particular data base you wish to query. For example, you give the command DISPLAY SELECTED "CALENDAR to query your appointment calendar. You would then be prompted for the match criteria you wish to use for each field of the index, specifically, for DATE followed by TIME and finally for PERSON-EVENT.

To select records where a certain field is equal to a particular value (either numerically or alphabetically), you enter the value you wish to match on. For example, to get your appointments for a specific DATE, just enter that date when prompted. To match on values greater than a particular value (again, either numerically or alphabetically), precede the value by a greater-than sign. For example, to select records where a field (named AMOUNT) is greater than 20.00, respond to the AMOUNT prompt with >20.00. A less-than sign may also be used with appropriate results. Greater-than and less-than signs may also be used with DATE and TIME fields to get records that are after or before a particular date or time.

Several other match criteria may be used. Preceding your response value with a $ sign will match on a substring within the field. For example, to select the month of March you respond with a $-03- to the prompt for the DATE match criteria if your date was in the form of YY-MM-DD. If your date entries had the month's name written out or abbreviated, you could use $MAR to specify March. If you wish to select records where a field is not equal to a certain value, precede the value with a # sign. If you are indifferent to the value and any value of a specific field is acceptable, you should enter a ? mark or just hit RETURN when prompted for that field's criteria.

Sorting is a good example of this power, but an even better demonstration is the ability to interrogate the data base and to display records that have certain attributes or characteristics.

Let's consider several more complex examples of selection criteria. The following would display all calendar records during 1984 with the word ACCOUNTANT somewhere in the PERSON-EVENT field:

```
DATE? $84-
TIME?          (RETURN)
PERSON-EVENT? $ACCOUNTANT
```

On the other hand, if you wish to display all appointments on July 20, 1985, at 2:00 p.m. or after, type:

```
DATE? 85-07-20
TIME? >1:59PM
PERSON-EVENT? ?
```

Similarly, you can use match criteria with the free-form ENTRY list. Specifically, you can match on the occurrence of keywords in the ENTRY list. For example, you could look for the word BIRTHDAY in the ENTRY field of the CALENDAR data base, or if you wanted to be even more specific, you could search for records where the keywords BIRTHDAY and SURPRISE both appear to display your record for John Doe's party on October 15th entered previously.

In addition to keywords, you can use the same match criteria discussed above for index fields for each word in the ENTRY list. For example, responding to the ENTRY match prompt with the list #FRED? PARTY would select records where the first word of the ENTRY list is not FRED and the third word is PARTY. The ? mark in the second position of the criteria list indicates to the

LOGO data base that any value is OK for the second word of the ENTRY list.

Listing 2 contains a sample dialog illustrating the creation and querying of two data bases. To help differentiate between the input and the output, they are printed in the listing in different type styles. The lighter printing represents the computer's output whereas the darker printing is the database user's input. The words shown within "curly braces" are comments explaining just what is being done and why. Listing 2 also shows you how you can DELETE records—either EVERY record or only SELECTED records. ■

Listing 1.

```
TO CREATE :TITLE :INDEX
   MAKE WORD :TITLE "*INDEX :INDEX
   IF :INDEX = [] THEN MAKE WORD :TITLE "*COUNT 0
END

TO ADD :NAME
   MAKE "DBNAME :NAME
   MAKE "INDEX THING WORD :NAME "*INDEX
   IF :INDEX = [] THEN MAKE "COUNT THING WORD :NAME "*COUNT
   ADD.REC
END

TO ADD.REC
   LOCAL "TEMP
   PRINT [] MAKE "IVAL PACK ASK :INDEX
   IF :IVAL = [] THEN MAKE "COUNT :COUNT + 1 MAKE "IVAL :COUNT MAKE
      WORD :DBNAME "*COUNT :COUNT
   PRINT1 WORD "ENTRY? CHAR 32
   MAKE "TEMP REQUEST
   IF FIRST :TEMP = "QUIT THEN TOPLEVEL
   PPROP :DBNAME :IVAL :TEMP
   ADD.REC
END

TO PACK :ULIST
   LOCAL "TEMP
   IF :ULIST = [] THEN OUTPUT []
   IF BUTFIRST :ULIST = [] THEN OUTPUT FIRST :ULIST
   MAKE "TEMP WORD ( FIRST :ULIST ) "/
   OUTPUT WORD :TEMP PACK ( BUTFIRST :ULIST )
END

TO ASK :INDEX
   LOCAL "TEMP
   IF :INDEX = [] THEN OUTPUT []
   ( PRINT1 WORD ( FIRST :INDEX ) "? CHAR 32 )
   MAKE "TEMP REQUEST
   IF :TEMP = [] THEN MAKE "TEMP "?
   MAKE "TEMP FIRST :TEMP
   OUTPUT FPUT :TEMP ASK ( BUTFIRST :INDEX )
END

TO PPROP :NAME :PROPERTY :VALUE
   .GCOLL
   LOCAL "TEMP
   IF :PROPERTY = [] THEN MAKE "PROPERTY "'
   MAKE "TEMP ( WORD :NAME "/ :PROPERTY )
   IF NOT THING? "PROP.LIST THEN MAKE "PROP.LIST []
   MAKE :TEMP :VALUE
   MAKE "PROP.LIST MERGE.ELEMENT :TEMP :PROP.LIST
END

TO DELETE
   MAKE "OPTION "DELETE
END

TO DISPLAY
   MAKE "OPTION "DISPLAY
   ZERO :INDEX
END

TO EVERY :NAME
   .GCOLL
   MAKE "ALL? "TRUE
   FETCH NAME.LIST :NAME
END

TO SELECTED :NAME
   .GCOLL
   MAKE "ALL? "FALSE
   CRITERIA
   FETCH NAME.LIST :NAME
END

TO FETCH :L
   IF :L = [] THEN TOTALS :INDEX STOP
   LOCAL "TEMP
   MAKE "TEMP FIRST :L
   MAKE "TENTRY THING :TEMP
   IF NOT :INDEX = [] THEN MAKE "TINDEX BUTFIRST UNPACK :TEMP
   TEST :ALL?
   IFFALSE TEST OK? :TEMP
   IFTRUE IF :OPTION = "DISPLAY THEN DISPLAY.REC
   IFTRUE IF :OPTION = "DELETE THEN ( PRINT [ DELETING: ] :TEMP )
      ERNAME :TEMP MAKE "PROP.LIST DELETE.WORD :TEMP :PROP.LIST
   FETCH ( BUTFIRST :L )
END

TO NAME.LIST :NAME
   OUTPUT SELECT.NAME :PROP.LIST :NAME
END

TO UNPACK :PWORD
   IF :PWORD = "' THEN OUTPUT []
   OUTPUT FPUT FPART :PWORD UNPACK LPART :PWORD
END

TO LPART :W
   IF :W = "' THEN OUTPUT "'
   IF FIRST :W = "/ THEN OUTPUT BUTFIRST :W
   OUTPUT LPART BUTFIRST :W
END

TO FPART :W
   IF :W = "' THEN OUTPUT "'
   IF FIRST :W = "/ THEN OUTPUT "'
   OUTPUT WORD ( FIRST :W ) FPART ( BUTFIRST :W )
END


TO DELETE.WORD :WORD :LIST
   IF :LIST = [] THEN OUTPUT []
   TEST :WORD = FIRST :LIST
   IFTRUE OUTPUT DELETE.WORD :WORD ( BUTFIRST :LIST )
   IFFALSE OUTPUT FPUT FIRST :LIST DELETE.WORD :WORD ( BUTFIRST
      :LIST )
END

TO SELECT.NAME :L :NAME
   LOCAL "TEMP
   IF :L = [] THEN OUTPUT []
   MAKE "TEMP FIRST :L
   IF ( FPART :TEMP ) = :NAME THEN OUTPUT FPUT :TEMP SELECT.NAME
      ( BUTFIRST :L ) :NAME
   OUTPUT SELECT.NAME ( BUTFIRST :L ) :NAME
END

TO CRITERIA
   LOCAL "TEMP
   IF NOT :INDEX = [] THEN PRINT [] PRINT ['ENTER INDEX SELECTION
      CRITERIA:'] MAKE "CINDEX ASK :INDEX
   PRINT [] PRINT ['ENTER NUMBER FOR ENTRY CRITERIA:']
   PRINT ['1 -- ANY ENTRY VALUE']
   PRINT ['2 -- KEYWORD MATCHES ONLY']
   PRINT ['3 -- ENTRY FIELD MATCHES']
   MAKE "TEMP FIRST REQUEST
   IF :TEMP = 2 THEN PRINT [] PRINT ['ENTER LIST OF KEYWORDS:']
      MAKE "TEMP FPUT :TEMP REQUEST
   IF :TEMP = 3 THEN PRINT [] PRINT ['ENTER FIELD MATCH CRITERIA:']
      MAKE "TEMP FPUT :TEMP REQUEST
   MAKE "CNUM FIRST :TEMP
   MAKE "CENTRY BUTFIRST :TEMP
END

TO OK? :RECORD
   IF NOT :INDEX = [] THEN IF NOT MATCH? :CINDEX :TINDEX THEN OUTPUT
      "FALSE
   IF :CNUM = 2 THEN OUTPUT SUBSET? :CENTRY :TENTRY
   IF :CNUM = 3 THEN OUTPUT MATCH? :CENTRY :TENTRY
   OUTPUT "TRUE
END

TO MATCH? :FILTER :L
   IF :FILTER = [] THEN OUTPUT "TRUE
   IF :L = [] THEN OUTPUT "FALSE
   MAKE "TF FIRST :FILTER
   MAKE "TL FIRST :L
   MAKE "V ( :TF = :TL )
   MAKE "TF.1ST FIRST :TF
   IF :TF.1ST = "> THEN MAKE "V NOT PRECEDE? :TL ( BUTFIRST :TF )
   IF :TF.1ST = "< THEN MAKE "V PRECEDE? :TL ( BUTFIRST :TF )
   IF :TF.1ST = "* THEN MAKE "V SUBSTRING? ( BUTFIRST :TF ) :TL
   IF :TF.1ST = "# THEN MAKE "V NOT ( ( BUTFIRST :TF ) = :TL )
   IF :TF.1ST = "? THEN MAKE "V "TRUE
   IF NOT :V THEN OUTPUT "FALSE
   OUTPUT MATCH? ( BUTFIRST :FILTER ) ( BUTFIRST :L )
END

TO SUBSET? :SET1 :SET2
   IF :SET1 = [] THEN OUTPUT "TRUE
   TEST MEMBER? ( FIRST :SET1 ) :SET2
   IFTRUE OUTPUT SUBSET? ( BUTFIRST :SET1 ) :SET2
   IFFALSE OUTPUT "FALSE
END

TO PRECEDE? :E1 :E2
   TEST ALLOF ( NUMBER? :E1 ) ( NUMBER? :E2 )
   IFTRUE IF :E1 < :E2 THEN OUTPUT "TRUE ELSE OUTPUT "FALSE
   IF :E1 = "' THEN OUTPUT "TRUE
   IF :E2 = "' THEN OUTPUT "FALSE
   IF ASCII ( FIRST :E1 ) < ASCII ( FIRST :E2 ) THEN OUTPUT "TRUE
   IF ASCII ( FIRST :E1 ) > ASCII ( FIRST :E2 ) THEN OUTPUT "FALSE
   OUTPUT PRECEDE? BUTFIRST :E1 BUTFIRST :E2
END

TO SUBSTRING? :SUB :STG
   IF :SUB = "' THEN OUTPUT "TRUE
   IF :STG = "' THEN OUTPUT "FALSE
   IF NOT ( FIRST :SUB ) = ( FIRST :STG ) THEN OUTPUT SUBSTRING?
      :SUB ( BUTFIRST :STG )
   OUTPUT SUBSTRING? ( BUTFIRST :SUB ) ( BUTFIRST :STG )
END

TO DISPLAY.REC
   IF NOT :INDEX = [] THEN PRINTPAIRS :INDEX :TINDEX
   IF NOT :TENTRY = [] THEN ( PRINT [ ENTRY: ] :TENTRY )
   PRINT []
END

TO PRINTPAIRS :L1 :L2
   LOCAL "TEMP
   IF :L1 = [] THEN STOP
   MAKE "TEMP WORD "TOTAL- ( FIRST :L1 )
   TEST NUMBER? FIRST :L2
   IFTRUE THEN MAKE :TEMP ( THING :TEMP ) + FIRST :L2
   IFFALSE THEM MAKE :TEMP []
   ( PRINT1 ( FIRST :L1 ) WORD ": CHAR 32 ) PRINT FIRST :L2
   PRINTPAIRS ( BUTFIRST :L1 ) ( BUTFIRST :L2 )
END

TO MERGE.ELEMENT :E :L
   IF :L = [] THEN OUTPUT FPUT :E :L
   TEST PRECEDE? :E FIRST :L
   IFTRUE OUTPUT FPUT :E :L
   IFFALSE OUTPUT FPUT ( FIRST :L ) MERGE.ELEMENT :E
      BUTFIRST :L
END

TO ZERO :L
   IF :L = [] THEN STOP
   MAKE WORD "TOTAL- ( FIRST :L ) 0
   ZERO BUTFIRST :L
END

TO TOTALS :L
   LOCAL "TEMP
   IF :L = [] THEN STOP
   MAKE "TEMP WORD "TOTAL- ( FIRST :L )
   IF NOT THING :TEMP = [] THEN ( PRINT ['TOTAL FOR']
      FIRST :L THING :TEMP )
   TOTALS BUTFIRST :L
END
```

Listing 2.

```
?CREATE *FACTS []
( The empty list, i.e., [], behind name
means the database does not have an
index. )

?ADD *FACTS

ENTRY? BOB LOVES PIZZA

ENTRY? BOB HATES BEANS AND ROOT BEER

ENTRY? BEANS ARE CHEAP

ENTRY? FRED LIKES PIZZA

ENTRY? FRED LIKES ROOT BEER

ENTRY? MARY HATES PIZZA

ENTRY? MARY LIKES BOB

ENTRY? QUIT
( Entering QUIT causes the addition of
records to cease for the time being.
Later, more records could be added by
again giving the command ADD "FACTS. )

?DISPLAY SELECTED *FACTS

ENTER NUMBER FOR ENTRY CRITERIA:
1 -- ANY ENTRY VALUE
2 -- KEYWORD MATCHES ONLY
3 -- ENTRY FIELD MATCHES
2    ( For keyword match )

ENTER LIST OF KEYWORDS:
BOB BEER  ( Selects only records with
both BOB and BEER in entry. )

ENTRY: BOB HATES BEANS AND ROOT BEER
( Only one such record. )

?DISPLAY SELECTED *FACTS

ENTER NUMBER FOR ENTRY CRITERIA:
1 -- ANY ENTRY VALUE
2 -- KEYWORD MATCHES ONLY
3 -- ENTRY FIELD MATCHES
3    ( To specify matching on each field
(or word) of the entry. )

ENTER FIELD MATCH CRITERIA:
#BOB ? PIZZA  ( Selects records where:
(1) first field/word is not BOB, and
(2) second field can be anything, and
(3) third field is PIZZA, and
(4) all other fields (if any) can
have any values. )

ENTRY: FRED LIKES PIZZA

ENTRY: MARY HATES PIZZA

?DELETE SELECTED *FACTS
( NOTE: Deleting records -- not displaying
them. )

ENTER NUMBER FOR ENTRY CRITERIA:
1 -- ANY ENTRY VALUE
2 -- KEYWORD MATCHES ONLY
3 -- ENTRY FIELD MATCHES
3    ( Match fields in entry )

ENTER FIELD MATCH CRITERIA:
BOB  ( Will delete all records where BOB
is the first field/word. )

DELETING: FACTS/1
DELETING: FACTS/2

?DISPLAY EVERY *FACTS

ENTRY: BEANS ARE CHEAP

ENTRY: FRED LIKES PIZZA

ENTRY: FRED LIKES ROOT BEER

ENTRY: MARY HATES PIZZA

ENTRY: MARY LIKES BOB
( Notice that all records where BOB is
the first word have been deleted. )

?DELETE EVERY *FACTS

DELETING: FACTS/3
DELETING: FACTS/4
DELETING: FACTS/5
DELETING: FACTS/6
DELETING: FACTS/7

?DISPLAY EVERY *FACTS
?  ( Nothing displayed because all FACTS
have been deleted. )

?CREATE *CHECKS [DATE PAYEE AMOUNT]
( This is a new database named CHECKS
with an index consisting of three items:
DATE, PAYEE and AMOUNT. )

?ADD *CHECKS

DATE? 84-03-15
PAYEE? ED'S-GARAGE
AMOUNT? 12.35
ENTRY? LUBE JOB

( NOTE: Entering date in the form YY-MM-DD
assures that the records will all be
sorted from the earliest date to the
latest date. )

DATE? 84-02-10
PAYEE? COMPUTER-STATION
AMOUNT? 29.95
ENTRY? LOGO SOFTWARE FOR C-64

( NOTE: There can not be any spaces in
an index entry -- so use a dash instead,
e.g., COMPUTER-STATION or ED'S-GARAGE. )

DATE? 84-03-15
PAYEE? BOB'S-HAULING
AMOUNT? 10.00
ENTRY? HAULING TRASH

DATE? 84-03-21
PAYEE? COMPUTER-STATION
AMOUNT? 19.95
ENTRY? GAME SOFTWARE FOR C-64

DATE? 84-01-08
PAYEE? ED'S-AUTO-REPAIR
AMOUNT? 62.50
ENTRY? TUNE UP

DATE? 84-02-22
PAYEE? MACY'S
AMOUNT? 22.35
ENTRY? BIRTHDAY PRESENT

DATE? 84-02-15
PAYEE? ED'S-GARAGE
AMOUNT? 42.35
ENTRY? NEW TIRE

DATE?   ( RETURN )
PAYEE?   ( RETURN )
AMOUNT?   ( RETURN )
ENTRY? QUIT  ( QUIT only works with the
ENTRY query -- not with index queries. )

?DISPLAY EVERY *CHECK

DATE: 84-01-08
PAYEE: ED'S-AUTO-REPAIR
AMOUNT: 62.50
ENTRY: TUNE UP

DATE: 84-02-10
PAYEE: COMPUTER-STATION
AMOUNT: 29.95
ENTRY: LOGO SOFTWARE FOR C-64

DATE: 84-02-15
PAYEE: ED'S-GARAGE
AMOUNT: 42.35
ENTRY: NEW TIRE

DATE: 84-02-22
PAYEE: MACY'S
AMOUNT: 22.35
ENTRY: BIRTHDAY PRESENT

DATE: 84-03-15
PAYEE: BOB'S-HAULING
AMOUNT: 10.00
ENTRY: HAULING TRASH

DATE: 84-03-15
PAYEE: ED'S-GARAGE
AMOUNT: 12.35
ENTRY: LUBE JOB

DATE: 84-03-21
PAYEE: COMPUTER-STATION
AMOUNT: 19.95
ENTRY: GAME SOFTWARE FOR C-64

TOTAL FOR AMOUNT 199.45

( Notice that the records are displayed
automatically in date sequence and where
there is more than one record with the
same date they are in alphabetical
order by payee.  Also note that the
total is automatically calculated and
displayed for the numeric index fields.
-- in this case -- the AMOUNT field. )

?DISPLAY SELECTED *CHECKS

DATE?  ( RETURN )
PAYEE? #ED'S
AMOUNT: >20.00

ENTER NUMBER FOR ENTRY CRITERIA:
1 -- ANY ENTRY VALUE
2 -- KEYWORD MATCHES ONLY
3 -- ENTRY FIELD MATCHES
1    ( This will display all checks
where the payee index field contains the
character string ED'S and the amount is
greater than 20.00. )

DATE: 84-01-08
PAYEE: ED'S-AUTO-REPAIR
AMOUNT: 62.50
ENTRY: TUNE UP

DATE: 84-02-15
PAYEE: ED'S-GARAGE
AMOUNT: 42.35
ENTRY: NEW TIRE

TOTAL FOR AMOUNT 104.85

( The total is calculated for only the
records displayed. )

?DISPLAY SELECTED *CHECKS

DATE? <84-03-01
PAYEE?  ( RETURN )
AMOUNT?  ( RETURN )

ENTER NUMBER FOR ENTRY CRITERIA:
1 -- ANY ENTRY VALUE
2 -- KEYWORD MATCHES ONLY
3 -- ENTRY FIELD MATCHES
2    ( Match on keywords )

ENTER LIST OF KEYWORDS:
SOFTWARE

( Will display all checks with a date
less than (i.e., before) March 1, 1984
and where the keyword SOFTWARE appears
somewhere in the entry field. )

DATE: 84-02-10
PAYEE: COMPUTER-STATION
AMOUNT: 29.95
ENTRY: LOGO SOFTWARE FOR C-64

TOTAL FOR AMOUNT 29.95

?SAVE *CHECKS-DBASE

( Will save the current version of
the CHECKS-DBASE on disk.  Later, it
may be loaded back into LOGO by using
the command READ "CHECKS-DBASE and
updated by adding more records. )
```

USER GROUPS

Commodore user groups nationwide and around the world provide invaluable assistance to Commodore computerists. If you are looking for people who share your computing interests, or if you need help getting started with your computer, contact the group near you.

This list is compiled from groups who responded to a survey conducted by Pete Baczor, Commodore's user group coordinator. If you would like your group to appear here, or if you need information about Commodore's user group support, contact Pete at Commodore Business Machines, 1200 Wilson Drive, West Chester, PA 19380.

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User Group Support Program

Commodore is creating a program to support Commodore User Groups.

The two major components—an electronic bulletin board on CompuServe and a newsletter are now available.

The electronic bulletin board is a dedicated section of the Commodore Information Network of CompuServe accessible only by "Approved" User Groups. It will be used for direct communication as well as Commodore announcements.

The newsletter, INPUT/OUTPUT, will include announcements, user group programs, calender of events, letters, questions, product specifications, programs, and surveys. It will be a newsletter FOR user groups BY user groups supported by Commodore without advertisements.

For future issues of the newsletter Commodore is accepting announcements of user group activities, articles of interest, letters to the editor, and general questions. Please forward all correspondence with the name of your user group to:

Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
Attn: Jim Gracely

Computers For The Blind

Talking computers give blind and visually impaired people access to electronic information. The question is how and how much?

The answers can be found in "The Second Beginner's Guide to Personal Computers for the Blind and Visually Impaired" published by the National Braille Press. This comprehensive book contains a Buyer's Guide to talking microcomputers and large print display processors. More importantly it includes reviews, written by blind users, of software that works with speech.

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CHIPWITS

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crabs. In addition, the authors had tried to think of cute objects the robot could find and "eat." From the nature of the list, it was beginning to look like a Chipwit would turn out to be a sort of "janitor" robot, a benevolent dumpster searching rooms for banana peels, old newspapers, and empty bottles and cans. Doug's robot had an arm that reached out, grabbed the offending piece of rubbish, and deposited it into a receptacle on the robot that looked like a cross between a mouth and the rear of a garbage truck.

The idea of an ecology-minded robot seemed acceptable, but the authors kept fishing around for something with more appeal. Finally, Doug's wife came to the rescue. Inga suggested it might be cute to have the robot eat something that people could identify with—something like pie and coffee. The idea of a robot running around in a monster-filled maze looking for pie and coffee to replenish its energy appealed to Doug and Mike. In Mike's words, "We knew the only true sources of energy in the universe were pie and coffee."

After many long weeks filled with 16-hour days, *Chipwits* was finally ready to be unveiled at the January Consumer Electronics Show.

At CES, almost everyone who saw *Chipwits* warmed up to the little robot. Publishers, distributors and reporters all praised Mike and Doug for their achievement, but the most rewarding and unexpected recognition came from their peers. In two's and three's, programmers from competing software firms dropped by to see the new robot game that teaches children the fundamentals of computer programming.

Chipwits looked like it might be a hit. The irresponsible fling at becoming software superstars hadn't been so irresponsible after all. Mike and Doug had come up with an original idea, designed a game, programmed it on three different computers, found a publisher for it, and delivered a successful product in under eight months. Simple, right? "Well, only if you love punishment," says Mike. "Right," says Doug, who was last seen cross-country skiing at Yosemite, miles from the nearest golf course.

CHIPWITS GAME REVIEW

Chipwits effectively teaches the fundamental operations of a computer and how a program directly influences those operations.

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in the Workshop area of the play field, accessed with the pull-down menu. A Chipwit program is essentially a string of directional instructions and operators with "goodie" and "obstacle" arguments for the Chipwit to follow. Once the program is created, you then select an adventure from the Warehouse pull-down menu.

By placing your Chipwit in an adventure, you are able to test your programming. If the Chipwit doesn't fare too well in a room, it's easy enough to remedy by "debugging" the program. To debug, you simply go back to the Workshop, do your program editing, then give it another try. This feature, in particular, makes *Chipwits* most useful for teaching the concepts of programming. It clearly illustrates to the player how explicitly a computer will follow *wrong* instructions. The capability to return to the Workshop for debugging enforces the learn-by-doing concept of the game.

The IBOL-based program is stored on a set of "chips." A Chipwit chip set consists of the main panel (panel A) and nine subpanels (panels B-J). Since each panel can contain up to 40 different chips, complex programs may be structured. In order for the program instructions to execute in the right order, "input" and "output" wires are provided to connect the chips.

Editing any of the panels may be done with commands such as cut, paste, copy, and clear. Additionally, chips may be deleted or changed at will.

Sixteen Chipwits robots "live" on the disk and each may be taught to play any of eight different games. The games are adventures consisting of between four (easy) and 49 (difficult) rooms. Hence, the continued challenge level of the game is high.

The animation and graphics of *Chipwits* are up to Epyx's usual standards. The play action is excellent, although it is confined to the programming aspects of the game; once the Chipwit embarks on an adventure, it is under the control of the program contained on its chips.

Chipwit robots are predominantly silent, making mechanical sounds only as they move about and bump into things. A music programming facility is provided, however, to liven things up. Musical notes may be included in the program so the Chipwit will play a song for you—a very nice touch that allows the Chipwit to entertain as it functions.

Chipwits is delightful and delightfully easy to use. Well-written documentation makes understanding the objectives, controls, and features of the game a snap. The lower adventure levels, such as Greedville, are very easy to complete. As the adventure levels progress, however, so do their complexity and difficulty. Make no mistake about it, *Chipwits* is challenging even for the seasoned programmer.

I found *Chipwits* to be highly educational in addition to being highly entertaining. It effectively teaches the fundamental operations of a computer and how a program directly influences those operations. I also found *Chipwits* to be very challenging and even addictive on the more difficult play levels. The concept of the game is simple enough, but getting the Chipwit to act according to your wishes demands concentration and strategy. It's an excellent program that teaches by osmosis—you *have* to learn things to enable the robot to complete the level; the harder the level, the more you'll have to learn to write an effective program.

Regardless of your age, *Chipwits* is a worthwhile program that will keep you entertained and fascinated for many hours—I recommend it.

HOW TO ENTER PROGRAMS in *Power/Play*

The programs which appear in this magazine have been run, tested and checked for bugs and errors. After a program is tested, it is printed on a letter quality printer with some formatting changes. This listing is then photographed directly and printed in the magazine. Using this method ensures the most error-free program listings possible.

Whenever you see a word inside brackets, such as [DOWN], the word represents a keystroke or series of keystrokes on the keyboard. The word [DOWN] would be entered by pressing the cursor-down key. If multiple keystrokes are required, the number will directly follow the word. For example, [DOWN4] would mean to press the cursor-down key four times. If there are multiple words within one set of brackets, enter the keystrokes directly after one another. For example, [DOWN,RIGHT2] would mean to press the cursor-down key once and then the cursor-right key twice.

In addition to these graphic symbols, the keyboard graphics are all represented by a word and a letter. The word is either SHFT or CMD and represents the SHIFT key or the Commodore key. The letter is one of the letters on the keyboard. The combination [SHFT E] would be entered by holding down the SHIFT key and pressing the E. A number following the letter tells you how many times to type the letter. For example, [SHFT A4,CMD B3] would mean to hold the SHIFT key and press the A four times, then hold down the Commodore key and press the B three times.

The following chart tells you the keys to press for any word or words inside of brackets. Refer to this chart whenever you aren't sure what keys to press. The little graphic next to the keystrokes shows you what you will see on the screen.

SYNTAX ERROR

This is by far the most common error encountered while entering a program. Usually (sorry folks) this means that you have typed something incorrectly on the line the syntax error refers to. If you get the message ''?Syntax Error Break In Line 270'', type LIST 270 and press RETURN. This will list line 270 to the screen. Look for any non-obvious mistakes like a zero in place of an O or vice-versa. Check for semicolons and colons reversed and extra or missing parenthesis. All of these things will cause a syntax error.

There is only one time a syntax error will tell you the 'wrong' line to look at. If the line the syntax error refers to has a function call (i.e., FN A(3)), the syntax error may be in the line that defines the function, rather than the line named in the error message. Look for a line near the beginning of the program (usually) that has DEF FN A(X) in it with an equation following it. Look for a typo in the equation part of this definition.

ILLEGAL QUANTITY ERROR

This is another common error message. This can also be caused by a typing error, but it is a little harder to find. Once again, list the line number that the error message refers to. There is probably a poke statement on this line. If there is, then the error is referring to what is trying to be poked. A number must be in the range of zero to 255 to be poke-able. For example, the statement POKE 1024,260 would produce an illegal quantity error because 260 is greater than 255.

Most often, the value being poked is a variable (A,X...). This error is telling you that this variable is out of range. If the variable is being read from data statements, then the problem is somewhere in the data statements. Check the data statements for missing commas or other typos.

If the variable is not coming from data statements, then the problem will be a little harder to find. Check each line that contains the variable for typing mistakes.

OUT OF DATA ERROR

This error message is always related to the data statements in a program. If this error occurs, it means that the program has run out of data items before it was supposed to. It is usually caused by a problem or typo in the data statements. Check first to see if you have left out a whole line of data. Next, check for missing commas between numbers. Reading data from a page of a magazine can be a strain on the brain, so use a ruler or a piece of paper or anything else to help you keep track of where you are as you enter the data.

OTHER PROBLEMS

It is important to remember that the 64 and the PET/CBM computers will only accept a line up to 80 characters long. The VIC 20 will accept a line up to 88 characters long. Sometimes you will find a line in a program that runs over this number of characters. This is not a mistake in the listing. Sometimes programmers get so carried away crunching programs that they use abbreviated commands to get more than 80 (or 88) characters on one line. You can enter these lines by abbreviating the commands when

CHART OF SPECIAL CHARACTER COMMANDS

''[HOME]'' = UNSHIFTED CLR/ HOME
''[CLEAR]'' = SHIFTED CLR/HOME
''[DOWN]'' = CURSOR DOWN
''[UP]'' = CURSOR UP
''[RIGHT]'' = CURSOR RIGHT
''[LEFT]'' = CURSOR LEFT
''[RVS]'' = CONTROL 9
''[RVOFF]'' = CONTROL 0
''[BLACK]'' = CONTROL 1
''[WHITE]'' = CONTROL 2
''[RED]'' = CONTROL 3
''[CYAN]'' = CONTROL 4
''[PURPLE]'' = CONTROL 5
''[GREEN]'' = CONTROL 6
''[BLUE]'' = CONTROL 7
''[YELLOW]'' = CONTROL 8
''[ORANGE]'' = COMMODORE 1
''[BROWN]'' = COMMODORE 2
''[L. RED]'' = COMMODORE 3
''[GRAY1]'' = COMMODORE 4
''[GRAY2]'' = COMMODORE 5
''[L. GREEN]'' = COMMODORE 6
''[L. BLUE]'' = COMMODORE 7
''[GRAY3]'' = COMMODORE 8
''[F1]'' = F1
''[F2]'' = F2
''[F3]'' = F3
''[F4]'' = F4
''[F5]'' = F5
''[F6]'' = F6
''[F7]'' = F7
''[F8]'' = F8
''[POUND]'' = ENGLISH POUND
''[SHFT ˆ]'' = PI SYMBOL
''[↑]'' = UP ARROW

GRAPHIC SYMBOLS WILL BE REPRESENTED AS EITHER THE LETTERS SHFT (SHIFT) AND A KEY (''[SHFT Q,SHFT J,SHFT D,SHFT S]'') OR THE LETTERS CMDR (COMMODORE) AND A KEY (''[CMDR Q,CMDR G,COMDR Y,CMDR H]''). IF A SYMBOL IS REPEATED, THE NUMBER OF REPITITIONS WILL BE DIRECTLY AFTER THE KEY AND BEFORE THE COMMA (''[SPACE3,SHFT S4,CMDR M2]'').

you enter the line. The abbreviations for BASIC commands are on pages 133-134 of the VIC 20 user guide and 130-131 of the Commodore 64 user's guide.

If you type a line that is longer than 80 (or 88) characters, the computer will act as if everything is ok, until you press RETURN. Then, a syntax error will be displayed.

THE PROGRAM WON'T RUN!!

This is the hardest of problems to resolve; no error message is displayed, but the program just doesn't run. This can be caused by many small mistakes typing a program in. First check that the program was written for the computer you are using. Check to see if you have left out any lines of the program. Check each line of the program for typos or missing parts. Finally, press the RUN/STOP key while the program is 'running'. Write down the line the program broke at and try to follow the program backwards from this point, looking for problems.

IF ALL ELSE FAILS

You've come to the end of your rope. You can't get the program to run and you can't find any errors in your typing. What do you do? As always, we suggest that you try a local user group for help. In a group of even just a dozen members, someone is bound to have typed in the same program.

If you do get a working copy, be sure to compare it to your own version so that you can learn from your errors and increase you understanding of programming.

If you live in the country, don't have a local user group, or you simply can't get any help, write to us. If you do write to us, include the following information about the program you are having problems with:

The name of the program
The issue of the magazine it was in
The computer you are using
Any error messages and the line numbers
Anything displayed on the screen
A printout of your listing (if possible)

Send your questions to:

Power/Play Magazine
1200 Wilson Drive
West Chester, PA 19380
ATTN: Program Problem

How to Use the Magazine Entry Program

The Magazine Entry Program on page 125 is a machine language program that will assist you in entering the programs in this magazine correctly. It is for use with the Commodore 64 only and was written by Mark Robin using the IEA Editor/Assembler. Once the program is in place, it works its magic without you having to do anything else. The program will not let you enter a line if there is a typing mistake on it, and better yet, it identifies the kind of error for you.

Getting Started

Type in the Magazine Entry Program carefully and save it as you go along (just in case). Once the whole program is typed in, save it again on tape or disk. Now RUN the program. The word POKING will appear on the top of the screen with a number. The number will increment from 49152 up to 50052, and just lets you know that the program is running. If everything is ok, the program will finish running and tell you to type NEW. If there is a problem with the data statements, the program will tell you where to find the problem.

Once the program has run, it is in memory ready to go. To activate the program, type SYS49152 and press RETURN. When the READY prompt is displayed, type TEST and press RETURN. You are now ready to enter the programs from the magazine.

Typing the Programs

All the program listings in this magazine that are for the 64 have an apostrophe followed by four letters at the end of the line (i.e., 'ACDF). The apostrophe and letters *should* be entered along with the rest of the line. This is a checksum that the Magazine Entry Program uses.

Enter the line and the letters at the end and then press RETURN, just as you normally would.

If the line is entered correctly, a bell is sounded and the line is entered into the computer's memory (without the characters at the end).

If a mistake was made while entering the line, a noise is sounded and an error message is displayed. Read the error message, then press any key to erase the message and correct the line.

IMPORTANT

If the Magazine Entry Program sees a mistake on a line, it *does not* enter that line into memory. This makes it impossible to enter a line incorrectly.

Error Messages and What They Mean

There are six error messages that the Magazine Entry Program uses. Here they are, along with what they mean and how to fix them.

NO CHECKSUM: This means that you forgot to enter the apostrophe and the four letters at the end of the line. Move the cursor to the end of the line you just typed and enter the checksum.

QUOTE: This means that you forgot (or added) a quote mark somewhere in the line. Check the line in the magazine and correct the quote.

PARENTHESIS: This means that you forgot (or added) a parenthesis somewhere in the line. Check the line in the magazine again and correct the parenthesis.

KEYWORD: This means that you have either forgotten a command or spelled one of the BASIC keywords (GOTO, PRINT..) incorrectly. Check the line in the magazine again and check your spelling.

# OF CHARACTERS: This means that you have either entered extra characters or missed some characters. Check the line in the magazine again. This error message will also occur if you misspell a BASIC command, but create another keyword in doing so. For example, if you misspell PRINT as PRONT, the 64 sees the letter P and R, the BASIC keyword ON and then the letter T. Because it sees the keyword ON, it thinks you've got too many characters, instead of a simple misspelling. Check spelling of BASIC commands if you can't find anything else wrong.

UNIDENTIFIED: This means that you have either made a simple spelling error, you typed the wrong line number, or you typed the checksum incorrectly. Spelling errors could be the wrong number of spaces inside quotes, a variable spelled wrong, or a word misspelled. Check the line in the magazine again and correct the mistake.

Magazine Entry Program

The Magazine Entry Program is available on disk, along with the other programs in this magazine, for $9.95. To order contact Loadstar at 1-800-831-2694.

```
1 PRINT "[CLEAR]POKING-";
5 P=49152 :REM $C000
10 READ A$:IF A$="END"THEN 80
20 L=ASC(MID$(A$,2,1))
30 H=ASC(MID$(A$,1,1))
40 L=L-48:IF L>9 THEN L=L-7
50 H=H-48:IF H>9 THEN H=H-7
60 PRINT"[HOME,RIGHT12]"P;
70 B=H*16+L:POKE P,B:T=T+B:P=P+1
   :GOTO 10
80 IF T<>103233 THEN PRINT"MISTAKE IN
   DATA --> CHECK DATA STATEMENTS":END
90 PRINT"DONE":END
1000 DATA 4C,23,C0,00,00,00,00,00
1001 DATA 00,00,00,00,00,00,00,0D
1002 DATA 00,58,C1,5E,C1,66,C1,76
1003 DATA C1,83,C1,8F,C1,EA,EA,EA
1004 DATA 4C,83,C0,A2,05,BD,1D,C0
1005 DATA 95,73,CA,10,F8,60,A0,02
1006 DATA B9,00,02,D9,3C,C1,D0,0B
1007 DATA 88,10,F5,A9,01,8D,10,C0
1008 DATA 4C,1F,C1,60,A0,03,B9,00
1009 DATA 02,D9,38,C1,D0,E0,88,10
1010 DATA F5,A9,00,8D,10,C0,4C,1F
1011 DATA C1,60,A0,03,B9,00,02,D9
1012 DATA 34,C1,D0,E0,88,10,F5,A0
1013 DATA 05,B9,A2,E3,99,73,00,88
1014 DATA 10,F7,A9,00,8D,18,D4,4C
1015 DATA 1F,C1,E6,7A,D0,02,E6,7B
1016 DATA 4C,79,00,A5,9D,F0,F3,A5
1017 DATA 7A,C9,FF,D0,ED,A5,7B,C9
1018 DATA 01,D0,E7,20,5A,C0,AD,00
1019 DATA 02,20,A3,C0,90,DC,A0,00
1020 DATA 4C,EA,C1,C9,30,30,06,C9
1021 DATA 3A,10,02,38,60,18,60,C8
1022 DATA B1,7A,C9,20,D0,03,C8,D0
1023 DATA F7,B1,7A,60,18,C8,B1,7A
1024 DATA F0,35,C9,22,F0,F5,6D,05
1025 DATA C0,8D,05,C0,AD,06,C0,69
1026 DATA 00,8D,06,C0,4C,BD,C0,18
1027 DATA 6D,07,C0,8D,07,C0,90,03
1028 DATA EE,08,C0,EE,0B,C0,60,18
1029 DATA 6D,0A,C0,8D,0A,C0,90,03
1030 DATA EE,09,C0,EE,0C,C0,60,0A
1031 DATA A8,B9,11,C0,85,FB,B9,12
1032 DATA C0,85,FC,A0,00,A9,12,20
1033 DATA D2,FF,B1,FB,F0,06,20,D2
1034 DATA FF,C8,D0,F6,20,54,C3,20
1035 DATA 7E,C3,20,E4,FF,F0,FB,A0
1036 DATA 1B,B9,3F,C1,20,D2,FF,88
1037 DATA 10,F7,68,68,A9,00,8D,00
1038 DATA 02,4C,74,A4,4B,49,4C,4C
1039 DATA 54,45,53,54,41,44,44,91
1040 DATA 91,0D,20,20,20,20,20,20
1041 DATA 20,20,20,20,20,20,20,20
1042 DATA 20,20,20,20,20,20,91,0D
1043 DATA 51,55,4F,54,45,00,4B,45
1044 DATA 59,57,4F,52,44,00,23,20
1045 DATA 4F,46,20,43,48,41,52,41
1046 DATA 43,54,45,52,53,00,55,4E
1047 DATA 49,44,45,4E,54,49,46,49
1048 DATA 45,44,00,4E,4F,20,43,48
1049 DATA 45,43,4B,53,55,4D,00,50
1050 DATA 41,52,45,4E,54,48,45,53
1051 DATA 49,53,00,C8,B1,7A,D0,FB
1052 DATA 84,FD,C0,09,10,03,4C,C7
1053 DATA C1,88,88,88,88,88,B1,7A
1054 DATA C9,27,D0,13,A9,00,91,7A
1055 DATA C8,A2,00,B1,7A,9D,3C,03
1056 DATA C8,E8,E0,04,D0,F5,60,4C
1057 DATA F2,C2,A0,00,B9,00,02,99
1058 DATA 40,03,F0,F2,C8,D0,F5,A0
1059 DATA 00,B9,40,03,F0,E8,99,00
1060 DATA 02,C8,D0,F5,20,D7,C1,4C
1061 DATA 56,C2,A0,0B,A9,00,99,03
1062 DATA C0,8D,3C,03,88,10,F7,A9
1063 DATA 80,85,02,20,1B,C3,A0,00
1064 DATA 20,9B,C1,20,CA,C1,20,31
1065 DATA C2,E6,7A,E6,7B,20,7C,A5
1066 DATA A0,00,20,AF,C0,F0,CD,24
1067 DATA 02,F0,06,20,D7,C0,4C,12
1068 DATA C2,C9,22,D0,06,20,BC,C0
1069 DATA 4C,12,C2,20,E7,C0,4C,12
1070 DATA C2,A0,00,B9,00,02,20,A3
1071 DATA C0,C8,90,0A,18,6D,09,C0
1072 DATA 8D,09,C0,4C,33,C2,88,A2
1073 DATA 00,B9,00,02,9D,00,02,F0
1074 DATA 04,E8,C8,D0,F4,60,18,AD
1075 DATA 0B,C0,69,41,8D,0B,C0,38
1076 DATA AD,0C,C0,E9,19,90,06,8D
1077 DATA 0C,C0,4C,60,C2,AD,0C,C0
1078 DATA 69,41,8D,0C,C0,AD,05,C0
1079 DATA 6D,07,C0,48,AD,06,C0,6D
1080 DATA 08,C0,8D,0E,C0,68,6D,0A
1081 DATA C0,8D,0D;C0,AD,0E,C0,6D
1082 DATA 09,C0,8D,0E,C0,38,E9,19
1083 DATA 90,06,8D,0E,C0,4C,96,C2
1084 DATA AD,0E,C0,69,41,8D,0E,C0
1085 DATA AD,0D,C0,E9,19,90,06,8D
1086 DATA 0D,C0,4C,AB,C2,AD,0D,C0
1087 DATA 69,41,8D,0D,C0,A0,01,AD
1088 DATA 0B,C0,CD,3C,03,D0,20,C8
1089 DATA AD,0C,C0,CD,3D,03,D0,17
1090 DATA C8,AD,0D,C0,CD,3E,03,D0
1091 DATA 0E,AD,0E,C0,CD,3F,03,D0
1092 DATA 06,20,64,C3,4C,7A,C0,AD
1093 DATA 10,C0,D0,11,98,48,68,4C
1094 DATA F7,C0,AD,10,C0,F0,01,60
1095 DATA A9,04,4C,F7,C0,A4,FD,A9
1096 DATA 27,91,7A,A2,00,C8,8D,0B
1097 DATA C0,91,7A,C8,E8,E0,04,D0
1098 DATA F5,A9,00,91,7A,20,64,C3
1099 DATA 4C,7A,C0,A0,00,B9,00,02
1100 DATA F0,11,C9,28,D0,03,EE,03
1101 DATA C0,C9,29,D0,03,EE,04,C0
1102 DATA C8,D0,EA,AD,03,C0,CD,04
1103 DATA C0,D0,01,60,A9,05,4C,F7
1104 DATA C0,A9,20,8D,00,D4,8D,01
1105 DATA D4,A9,09,8D,05,D4,A9,0F
1106 DATA 8D,18,D4,60,20,41,C3,A9
1107 DATA 81,20,77,C3,A9,80,20,77
1108 DATA C3,4C,71,C3,20,41,C3,A9
1109 DATA 11,20,77,C3,A9,10,20,77
1110 DATA C3,A9,00,8D,04,D4,60,8D
1111 DATA 04,D4,A2,70,A0,00,88,D0
1112 DATA FD,CA,D0,FA,60,END
```

ADV. ROAD

Continued from pg. 16

Reston's "Adventures for Girls," incorporates an animated character and a one-word parser that makes it more approachable by young players, but the story about survival in the Stone Age struck me as too authentic. Would you enjoy a game whose main activity consists of digging up and eating worms?

The Call of the Orc

Role-playing game aficionados might try one of two new games that enliven the traditional swords-and-sorcery scenario with shoot-'em-up action. *Gemstone Warrior* (Strategic Simulations) and *The Sword of Kadash* (Penguin) feature joystick or keyboard control of an animated warrior who explores a maze packed with various monsters and treasure. In both games, your character can blast away with his crossbow, and *Gemstone*'s warrior also shoots deadly fireballs at the foe. *Kadash* shows off better animation and a more interesting array of action-based challenges, while *Gemstone* offers action and a wide variety of magic spells (*Kadash* provides just one). But if you'd rather wait for the next *Ultima IV*, the fourth installment in the Lord British series, it will be ready sometime this fall. His company, Origin Systems, is also doing a Commodore 64 conversion of a new game called *Moebius*, which mixes martial arts with magic and swordplay in an Oriental setting.

Around the Bend

Infocom's latest is about a mailman who resorts to magic while making his rounds, but *Wishbringer* is not a sequel to *Sorcerer*. Other titles recently released include: Telarium's *Shadowkeep* (a role-playing game) and *Starman Jones*, a graphic adventure based on a Robert Heinlein novel; another role-playing game from Strategic Simulations, *Phantasie*; and a conversion of Datamost's *Earthly Delights*, an all-text mystery in which you play the victim rather than the detective. (Look for details on the best ones next issue.) On the horizon, Steve Meretzky, who wrote *Sorcerer* and *Hitchhiker's Guide*, is designing his first "disk drive detective" scenario—which may introduce the improved Infocom parser and signal the next battle of the Parser War.

ADV. WRITER

Continued from pg. 20

progresses. Finally, you are shown how to wrap up the process and save your completed game.

In the third section, the reference section, you are presented with a synopsis of each table within the data base and how it interacts with the other parts of the program. Included in this section are legal conditionals that you may manipulate and instructions on how to use the 32 flags that are available and how to enhance your adventure. This is all topped off with a glossary of the terms.

As with other Codewriter products, this manual is very accurate and complete. The tutorial is well planned and progresses logically. All facets of adventure development are discussed and demonstrated. The system employs liberal use of user-friendly menus to guide you through the various phases of creating the adventures. The manual also employs Codewriter's system of providing a border containing visual prompts on each page to help the non-computer user or neophyte along in the tutorial. They didn't leave anything out in this one except for a description of one of the tables (a minor oversight).

Some of the nicest features are: You can easily check for available memory, print out the contents of the tables, make sounds during the adventure and save an adventure in progress and reload it later. The interpreter is also quite forgiving to the user and you can assign words as synonyms (this is a biggie).

Like solving a puzzle when you already know the solution, so the result of *Adventurewriter* isn't as challenging, because of the fact that you (the creator of the adventure) already know the solution. This is not to imply that an adventure gamer cannot enjoy the benefits and intrigue of *Adventurewriter*. Perhaps, after having played many adventures, you think that you can make a bigger and better (the ultimate adventure) game. Perhaps, after having used *Adventurewriter*, you will enjoy creating more than playing. Only you can make this distinction in your own mind. *Adventurewriter* is a tool, just like any other program. You can use this tool to create. Your enjoyment will be in the pride of your creation more so than in the actual use.

GEOPOLITIQUE

Continued from pg. 38

scenarios commence in 1990 except for the last one, modeled on the present day economic/political/military situation, which is entitled "Confrontation 1984." Interestingly enough, the world tension in this scenario begins at level III—'Declaration of world war by one of the powers is credible'—which certainly stands as a rather pessimistic and worrying judgment.

The documentation for *Geopolitique 1990*, so often a weakness in other computer games, is particularly strong, with a rulebook that provides not only a glossary and player notes but also suggestions for adapting the game for classroom use. However, a few errors have crept into the rules. For instance, the scenario reference chart printed on the back cover is inaccurate. Players should be aware that the starting situation, even in the same scenario, can vary to such a degree that a particular game will be heavily weighted in favor of the U.S. or U.S.S.R. It may, therefore, be necessary to boot up the game several times to ensure that the computer initializes a sufficiently balanced situation.

No home computer game can adequately simulate all of the myriad complexities of modern day war and politics. Certain simplifications will have to be made and *Geopolitique 1990* is no exception. Thus, only a few minor countries are represented on an individual basis and some regions consisting of nations with exceedingly diverse politics, like the Middle East, are lumped into single territories. The game also includes no ideological factors or influences, so countries like Canada and the United Kingdom are just as likely to conclude agreements with the Soviet Union as they are with the U.S.

Nonetheless, despite such compromises, *Geopolitique 1990* does provide the player with a feel for, and insight into, the problems which the leaders of the two superpowers must confront in the not too distant future. With the fate of the world often hanging in the balance, decisions do not come easily, but what is simple to conclude is that *Geopolitique 1990* should appeal to all people who enjoy an entertaining, stimulating and instructive challenge.

Adventure Writing Contest Deadline Extended

Electronic Arts (2755 Campus Drive, San Mateo, CA 94404) has extended the deadline for their adventure writing contest to January 1, 1986. The contest awards $1000 to the best computer adventure written by owners of the company's **Adventure Construction Set** in three categories: fantasy/medieval, spy/mystery, and science fiction.

Introduction to the 64

Einstein's Computer Guide for the Commodore 64, a book published by Harcourt Brace Jovanovich (1250 Sixth Avenue, San Diego, CA 92101), gives new computer owners step-by-step instructions for operating and programming the Commodore 64.

Written by Jeff Einstein, the book requires no prior computer experience and covers general computer features and applications, from finding the power switch to understanding computer memory. It also includes instructions for start-up, formatting and duplicating a disk, and file management as well as a glossary.

The book includes chapters on graphics and sound, and includes line-by-line programming instructions. Seventy-five programs are included, and instructions are given for developing your own programs.

The book is available for $7.95.

Lucasfilm Games

Epyx (1043 Kiel Court, Sunnyvale, CA 94089) and Lucasfilm Ltd. have released two action games for the Commodore 64. **Ballblazer** and **Rescue on Fractalus!** have been awarded the 1985 Design Certificate of Merit from **Electronic Games Magazine**. As partners, Lucasfilm Ltd. will design and Epyx will market two more computer games under the tradename Lucasfilm Games.

Ballblazer is a futuristic, two-player fantasy sport which is played at fast speeds on a split screen showing both players' point of view. Players race across the 3-D play field attempting to steal the ball from an opponent and blast it through the goal.

In **Rescue on Fractalus!**, the player pilots to the planet Fractalus to rescue fellow pilots. To succeed, players must navigate rugged mountains, elude suicide saucers, and destroy enemy gun emplacements.

Retail prices were not available at publication time.

War Game Series

MicroProse (120 Lakefront Drive, Hunt Valley, MD 21030) has released the "Command Series" simulations for the Commodore 64. **Crusade in Europe**, the first in the series, simulates the American and British struggle against Nazi Germany from the D-day invasion to the Battle of the Bulge. It includes three short battle scenarios that can be played in an hour and two longer scenarios that take two to four hours. The full campaign game may take a day to play all at once, but since any game can be saved at any point, it can be played over several sittings.

Decisions in the Desert, the second in the series, recreates the tense battle between Field Marshall Erwin Rommel's Afrika Korps and the British 8th Army for control of North Africa. Other programs in the series include **Sword of Zion**, the Arab-Israeli Wars; **Blitzkrieg 1940**, the German victories early in the Second World War; and **Drive on Moscow**, Hitler's war on Russia. Each retails for $39.95.

Introductory-Level Fantasy Game

Wishbringer is Infocom's (55 Wheeler Street, Cambridge, MA 02138) latest interactive fantasy for the introductory level player on the Commodore 64. You are a mail clerk in a small seaside town. Your boss gives you a mysterious envelope which you must deliver to the Olde Magick Shoppe on the other side of town. At the Shoppe, you learn that the owner's cat has been kidnapped by somebody called the "Evil One." When you set out in search of the cat, you find the feline is not the only thing missing. The entire town has changed, familiar people and places are gone or twisted into sinister new forms. Overseeing this skewed environment is the "Evil One" and her henchmen, the Boot Patrol.

To find the cat and avoid being jailed by the Boots, you'll need to use skill and cunning. As the ancient proprietress of the Magick Shoppe reveals, you'll also find help in the form of a magic stone called Wishbringer. However, you must find this stone and learn to wield its terrible power.

Wishbringer can be played on two difficulty levels. Using magic, the game is a perfect introduction to interactive fiction. Without magic, all of the puzzles can be solved by purely logical means. The game retails for $34.95.

NEXT MONTH

WATCH FOR THESE UPCOMING ISSUES

Commodore Microcomputers, September/October: The AFL-CIO is trying to prevent "electronic cottagers" from doing computer-related work at home. If it is successful, what will that mean for the computer industry's freelancers and at-home entrepreneurs? Find out in this issue.

AND YOU'LL ALSO FIND

- Programming the Commodore 128.
- An overview of voice synthesizers and voice recognition for the 64.
- Free programs to type and save.
- Reviews of the latest software for your Commodore computer.

Commodore Power/Play, October/November: Would you rather make war or music on your Commodore 64? This issue shows you the best way to do both, with overviews of 20th century war games and music software for your favorite computer.

ALSO IN THIS ISSUE:

- Programs for the Commodore 128.
- More game reviews than any other Commodore-specific magazine.
- Free game programs to type and save.
- Fun and games with the Jazz Scats, software developers who didn't like computers very much, at first.

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AMAZING DAISY

NOW! FULL SIZE, FULL FEATURE, LETTER QUALITY AT ONLY $353

If you have been searching for a letter quality printer you probably found that the flood of claims and counterclaims were a real roadblock in your search. Not long ago we were in the same position. We tried to determine which daisy wheel printer had all the features anyone could want, but would also appeal to the cost conscious buyer. Recently several manufacturers introduced printers that had features we were seeking. After a thorough assessment we eliminated all but one which precisely met our qualifications.

THE RESULTS ARE IN

We found the printer which has all the features anyone could want. We've named it the Aprotek Daisy 1120, a real heavy-duty workhorse printing at 20 characters per second. The manufacturer is Olympic Co. Ltd., a highly respected Japanese firm.

FEATURES GALORE

This printer has it all. To start with, it has a front control panel with indicators for Pitch Selection which allows for 10, 12, or 15 characters per inch (CPI) or Proportional Spacing. There is a Select (Online) button (with indicator) and a Line Feed button. You can also set Top-of-Form or Form Feed with the touch of the TOF button. Other front panel indicators include Power and Alarm.

To load a sheet of paper, simply place it in the feed slot and pull the paper bail lever. The paper feeds automatically to a 1 inch top margin and the carriage aligns to the selected left margin. In this manner, each page can have identical margins.

You can continue to use your Commodore while the Daisy 1120 is printing. The built in 2K buffer allows a page or two of concurrent printing and use of your computer for the next job. To really take advantage of your printer's optional features, the automatic Cut Sheet Feeder eliminates tiresome paper handling. Also available is the adjustable Tractor Feed option. *Compare our option prices!*

Best of all the Daisy 1120 is quiet: only 57 dB-A (compare with an average of 62-65 dB-A for others).

COMPLETE COMPATIBILITY

The Daisy 1120 uses industry standard Diablo® compatible printwheels. Scores of typeface styles are available at most computer or stationary stores. You can pop in a 10, 12, 15 pitch or proportional printwheel and use paper as wide as 14". At 15 CPI you can print 165 columns—a must for spreadsheet programs.

The Daisy 1120 uses the Diablo Hytype II® standard ribbon cartridges. Again universally available.

Not only is the hardware completely compatible, the control codes recognized by the Daisy 1120 are Diablo 630® compatible (industry standard). You can take advantage of all the great features of word processing packages and automatically use superscripts, subscripts, automatic underlining, bold-face (shadow printing) and doublestrike.

The printer has a set of rear switches which allow the use of standard ASCII as well as foreign character printwheels. Page length can be set to 8, 11, 12, or 15". The Daisy 1120 can also be switched to add automatic line feed if required.

THE BEST PART

When pricing a daisy wheel printer with all these features (if you could find one), you would expect to pay $600 or $700 dollars. The options would add much more, but our exhaustive research has paid off for you the Commodore user. We can now offer this printer for only **$353.** Order yours today!

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Try the Daisy 1120 for 2 weeks. If you are not satisfied for ANY reason we will refund the full price—promptly. A full 1-year parts and labor warranty is included. Another indication of quality and reliability.

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